RAILROAD GAZETTE

FRIDAY, JULY 27.

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Contributions.

Overtime on the Staten Island Rapid Transit Railroad.

JULY 24, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Let me refer to your mention, in your issue of the 20th inst., of the circular issued by our general superintendent, with reference to the 4th of July rush. Such instances are so rare I deem them of sufficient importance to have no misunderstanding about them.

You evidently think the men were only paid for time actually made. All employés of this company are paid for overtime at all times. In this case the men who made overtime were all wed double time. For instance, the engineer who made one and a half or two days was allowed three or four days' pay, and so on through the ranks.

N. CUMBERSON, Clerk.

The Advantages of Tight Coupling.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I take pleasure in sending you the inclosed letter, which I have just received from an engineer running on the Pennsylvania, which contains some interesting testimony on the question of slack. He says: "I have hauled trains with the Janney coupler and find I can start more cars with the improved draw-bar than with the link and pin coupler. I have hauled 75 cars equipped with Janney couplers and the Westinghouse air brake. On one trip particularly, with a train of 25 loaded stock cars, I stopped at a water plug which was a very hard place to start from. They work 40 cars with two consolidation engines, one in front and one behind, and it is all they can do to get away from that point with link and pin couplers. I had consolidation engine No. 309, and started 25 loaded cars from there easier than I ever started 20 loads with link and pin couplers. I have also hauled 76 cars empty with the Janney couper over the worst part of the Middle Division of the Pennsylvania Railroad, and 15 cars with link couplings, making 90 cars, covering three-quarters of a mile, lacking 3 ft., which is a remarkably long train, over reverse curves. I never saw the rear end of the train for 10 miles. I have run an engine on the Pittsburgh Division of the Pennsylvania road for 8 years, and I find the Janney or your coupler the best for heavy trains on crooked roads."

If you care to use this letter, or any part of it, I think it will be it interesting to some of your readers.

A. W. VAN DORSTON.

[Of course the observations of this Locomotive Engineer apply equally to any good vertical plane coupler. His position is simply that with tight couplers a long train is handled more easily than with loose slack, a fact which has already been demonstrated by others.—EDITOR RAILROAD GAZETTE.]

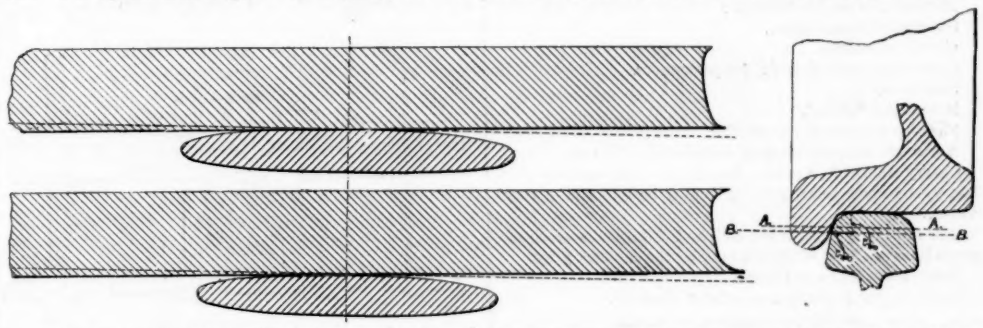
Rail Wear.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In returnnig to the subject of rail wear, I will say at the outset that your instances certainly seem to show a reaction in the matter of side angle from what was the tendency of a year or two back. I was in error as to Mr. Mattes' section, as you state, owing to measuring from an incorrect reproduction of it instead of taking his figures. His section, though, still shows an increase over the side angles prevalent a few years before. The Sandberg section is hardly a fair instance, as my remark was meant to apply to the United States only, and foreign rail sections never have shown the tendency in question. Your denial of the tendency rests then on the sections of the New York Central and the Pennsylvania, the latter of which I had not seen when I wrote. Two such roads are enough to establish a case for reaction, which may be permanent if the width of head is enough to give satisfactory bearing on the splice. Of this, however, I feel some doubt, for the following reasons:

The difficulty with splices at present is twofold. 1*st*. The insufficient bearing of the rail head on the splice, and 2*d*, the unsymmetrical form of the splice considered as a girder. The necessary result of the large lower flange given by the angle splice form is the lowering of the neutral axis well down toward the base of the splice. When the rail ends spring up from the reaction after being depressed, the strain in the top flange of the splice which had been compression from the load is suddenly converted into tension under very unfavorable circumstances. The top member is small, and its fibres a long way from the neutral axis. Hence, rupture would be by tearing apart and not by buckling or crushing, as would be the case if the breakage were caused by the compression of the load on the rail. Now, this is precisely the way in which rupture generally takes place in angle splices. Whether it is the result of the reaction of the rail ends or of the reversal of strains caused by the passage of the wheel from one rail to the other, as ably contended by you in your issue of Nov. 6, 1885, is immaterial. The result is the same.

It is clear that the top flange is the weak part of the splice. It is also clear that this is difficult to avoid without more room under the head than is given with the usual rail sections. If it is practicable to get it by widening the head without flaring its sides, that is the better way for strength of rail, although Mr. Milholland's experience and argument for a flaring head seem to me to have considerable force. His experience also reinforces my argument as to rail climbing.



I am not sure that I fully understand your argument on April 6 in regard to this. If I do, I hope that the enclosed diagrams will show that the inclination of the wheel flange to the curve makes no practical difference as to my claim. This was that the side angle of the head must be at least equal to the angle of the tangent to the wheel flange at the reverse between fillet and crown curve before it can have any effect on climbing.

The diagrams are sections of the Lehigh Valley rail and flange at the point of contact between flange and rail when both are new, and also at the point where the side of the rail head becomes tangent to the upper corner curve.*

The latter section shows a decided opening between the rail and wheel at the last mentioned point in all practicable positions of the wheel with reference to the rail, and it is evident that the straight rail side could not come into contact with the flange until the rail or flange is considerably worn. Hence the angle of the rail side, when as great as in the Lehigh section, or even greater, has no effect on climbing.

I find it difficult to admit Mr. Mattes' dictum quoted by you that "it is undeniable that excessive side slope leads to excessive wear." As I said before, the larger the surface exposed to wear with the same total side pressure against the rail the less the wear. When I say wear I mean destructive wear, viz.: diminution of rail-head width and cutting into the fillet of the flange.

Mr. Milholland's experience agrees with this when he says: "With such resisting surfaces it has been noted that late *years* of further wear can only be measured by wear of former *months*."

Before closing, I would like to inquire what you mean by the remark that "the resultant of the forces acting in a moving train will carry the wheels forward on the tangent to the curve at a given point, unless the speed is very low."

If this means to take into account the reaction of the rail against the flanges, it seems rather a self-evident proposition, inasmuch as if the wheels did not follow the tangent to the curve at each point of their progress the train would leave the track.

If, however, you disregard this reaction, I cannot concede its correctness. Whenever a train follows a curve at any except a very high speed, the front wheel of the truck crowds the rail; the rear wheel generally does not. Hence the truck stands at a slight angle to the rail, and if the flanges were removed the wheels would leave the track, on the prolongation of a tangent to the track at some point in the rear of the truck.

If, on the other hand, you are considering the forces acting, without regard to the reaction of the rail or to the direction of the truck's motion, you have the following:

1st. Centrifugal force pushing the train outwards or resisting its departure from a straight line, whichever it may be called.

2d. The inclination of the track inwards, which is supposed to balance the centrifugal force, except at abnormal speed.

3d. The draught of the engine which pulls the train in a diagonal direction toward the inner rail, and

4th. The resistance of the car itself and the train in its rear which pull the truck diagonally toward the inner rail in the opposite direction to the locomotive pull. Hence, if numbers 1 and 2 balance, and the rail reaction and side friction of the wheels be left out of account, the resultant of the forces acting is an impulsion of the train forward diagonally toward the inner rail.

In point of fact, however, the action is very similar to that of a horse towing a canal boat with the rope attached at some point sufficiently far from the bow to keep the boat's head pointed toward the opposite bank. But, you will say, the rope in this case is attached to the bow. Considering the car as a boat this is true, but the truck is the thing whose action we are considering, and, owing to the running forward of the inside wheel, and the falling behind of the outer one the truck, like the boat, is given a direction toward the opposite shore.

Now in the boat this tendency is resisted by the rudder. In the truck on a curve the outer rail is the rudder, which only takes effect when the train has run far enough forward pointing towards the outer rail to bring the flange of the forward wheel against the rail. Equilibrium then ensues, and the train pursues the same course as the canal boat, with its truck traveling always on a secant to the curve.

In the canal boat the amount of steering necessary will depend on how nicely the position of the towing post is adjusted. In the train the amount of pressure against the outer rail will depend upon the relation between the inward pull of the engine and the resistance of the wheels to sliding in the direction of the engine instead of rolling in the direction that the difference of length of their paths prompts them to.

W. HOWARD WHITE.

*In the horizontal sections the dotted lines represent the side of the rail with reference to the wheel on a tangent, the truck axles being parallel to the rail. The full lines show the rail and wheel when the forward wheel is against the outer rail and the rear wheel of the truck against the inner rail; a play of 1¼ in. and a truck wheel base of 6 ft. being assumed.

The Interior Finish of Cars.

The following letter was recently addressed to a large number of master car-builders:

457-475 EAST 10TH STREET,
NEW YORK, June 14, 1888.

DEAR SIR: We take the liberty of handing you herewith a series of four questions which we have propounded with a view to obtaining an expression of the opinions of a few of the leading men interested in car construction. Our sole idea is to ascertain what rank mahogany has as compared with other woods for this purpose. We shall highly appreciate the favor of your reply, and will be glad to reciprocate, if in our power, at any time.

While it is possible that we may give a summary of our investigations through the medium of one of the railroad papers, we will in no case use names, and whether we use it at all as indicated, we will mail to you the result of our investigations thus summarized, as it may be of interest to you as well as ourselves.

Yours truly,
W. E. UPTEGROVE & BRO.

(1) What wood or woods are you using for the interior finish of your coaches?

(2) If more than one, which would you prefer, supposing cost to be the same?

(3) Which of all woods (including mahogany) would you prefer, supposing cost were to be the same?

(4) Will you kindly give your reasons for this preference?

Replies were received from over twenty railroads and were handed to the *Railroad Gazette* for analysis and summary. The answers to the questions may be summarized as follows:

Wood Used for Inside Finish.

Oak and gum	1
Mahogany	5
Cherry and oak	1
Quartered oak	1
Solid mahogany, first class coaches; Solid ash or oak, second class coaches; Solid white ash, emigrant coaches	1
Oak, ash and mahogany	2
Ash and cherry	1
Cherry, oak, ash, mahogany	1
Mahogany and primavera	1
Cherry and mahogany	2
Ash, white walnut, quartered oak; Mahogany and black walnut	1
Oak	1
Mexican mahogany, not too dark	1
Georgia pine stained, second class coaches	1
Walnut, ash, cherry and mahogany	1
	21

The following woods would be preferred if cost were the same:

Mahogany	16
Oak	2
Ash	1
Oak and walnut	1
Quartered oak for day cars; Mahogany with bay wood moldings, cherry doors and sash and finish below belt for sleepers and special cars	1
	21

Reasons for the preference of mahogany:

Improves in appearance with age,

Can be scraped and varnished without looking shabby,

Resists effects of atmospheric changes, moisture, dryness,

heat and cold, which warp, check and open the joints of other woods.

Beauty.

Durability.

Free from sap and acids, which in other woods are objectionable to painter and cabinet maker.

Does not warp or twist.

Shade medium, and therefore pleasing to the eye.

"Greatly respected by *all* classes of passengers, and consequently does not receive the abuse from them that a coarser-appearing wood would."

Public prefer it.

Richest finish.

More susceptible to a superior and high quality of ornamentation.

Easily worked.

Easily finished.

Susceptible of the highest polish.

Most easily cleaned.

Stands best in all conditions of service.

Less shrinkage than oak and consequently preferable in spite of darker color.

Reasons for preferring oak:

Stands bad usage better.

Can be refinished.

Light color more cheerful for passengers.

Strongest.

Most easily finished.

The objections to other woods:

All woods except mahogany deteriorate with age.

Cherry stained to imitate mahogany looks well at first, but soon becomes shabby and cannot be effectively renovated.

Oak and ash are coarse grained, and if finished smooth the grain becomes filled with dirt, making the car look gray.

Maple looks cheap and tame.

Black walnut is gloomy, especially when old.

A Pennsylvania Drawbridge Lock.

The drawbridge of the passenger line of the New York division of the Pennsylvania over the Hackensack River was equipped about three months ago with what appears to be a very effective fastening for joining the rails on the draw with those on the fixed spans. This draw is a double track, Pratt truss, 253 ft. from centre to centre of end pins, and is turned by steam. Trains pass over it at full speed.

The device, of which the illustrations give a fair idea, is the invention of the Master Carpenter of the division, Mr. George W. Mershon, and Supervisor James R. Smith. The end rails on each end of the draw are 30 ft. in length, spiked for half this distance, the balance being held to gauge by the angle iron sleeves, 15 ft. long, one on each rail, or eight in all on the draw. These sleeves hold the rails to gauge and prevent them upsetting, but allow a vertical movement of about 1½ in. by means of the shaft *A* and the short arms *B*. The shaft is operated by the machinery for moving the wedges, under the ends of the draw. This vertical movement lifts the rails out of the grooves in the bed plates *C*, which rest on the ends of the fixed spans. These grooves insure the rails on the draw lining up properly with the fixed span rails. The sleeves will also hold the rails in place should they break. This portion of the device has been successful use for some years on the old Hackensack draw, now used entirely for freight, the Commercial Dock draw over the Passaic at Newark and the new Brunswick draw over the Delaware and Raritan Canal.

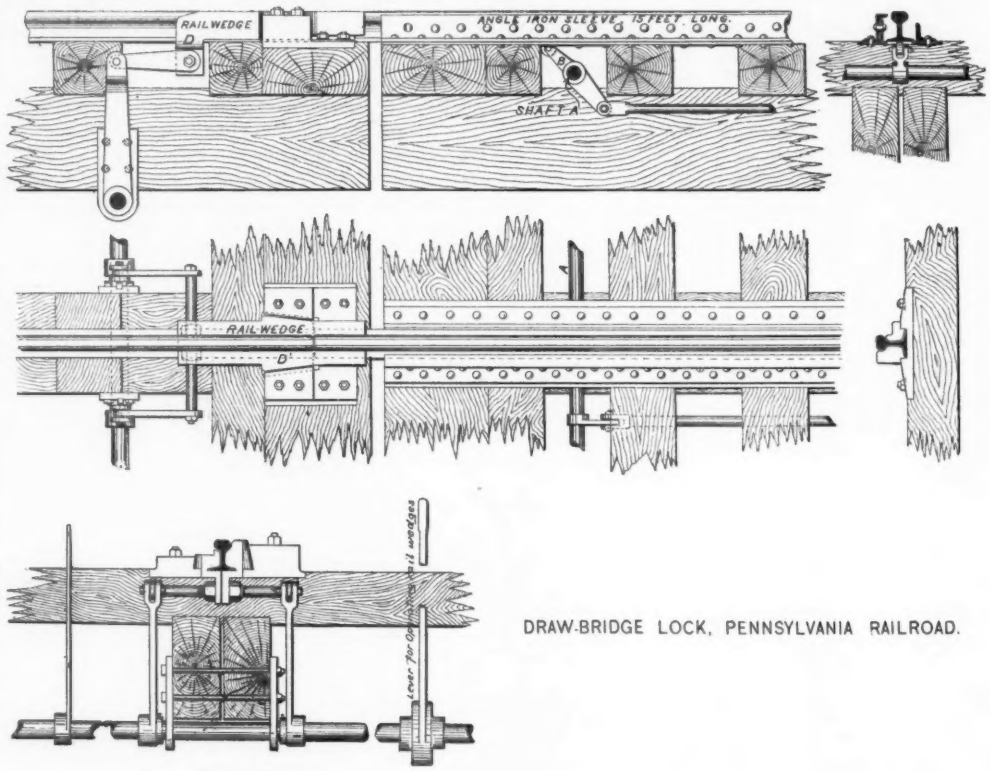
The opening between the rails at the end of the draw is sometimes as much as 2½ inches, and aside from the noise and jolt it gives in passing over it, is destructive both of the rolling stock and the rails. It is hardly necessary to say that a space of this width would not be tolerated on any other portion of the track. Part of the problem therefore to be solved was to carry the wheel over this opening, smoothly and safely. An examination of the drawings will show that this has been accomplished in a very simple and ingenious manner by means of the wedge-shape blocks *D*, operated by an upright lever placed between tracks, or they can be operated from the centre of the draw by steam or hand power. As soon as the rails are dropped into the grooves in the plates *C*, the wedges are forced forward, firmly splicing the rails together and the wheels are carried over the opening between the rails on the outside edge *D'*, of the wedges, which are made level with the top of the rails. All wear is taken up by the lever operating these wedges, as it has a catch dropping into a series of notches, so that the wedges can always be forced firmly into place.

This arrangement does away with the possibility of the rails not lining properly, and answers much the same purpose as a facing point lock on an interlocking switch, as it insures the proper position of the rails at a point quite as dangerous as any facing point switch, if not more so. The locking wedges, and the apparatus for raising the rails and the signals could very well be worked from the engine cabin in the middle of the bridge, and by interlocking the levers the greatest safety could be had, and also the minimum number of men at the bridge. The device carries the wheel over an opening varying from ⅛ to 2½ in., and without shock, which is sometimes of sufficient force to crack either the wheels or the rails, and last of all, it gives easy riding and lessens noise.

HENRY M. SPERRY.

Tank for Switching Engine, Chesapeake & Ohio Railway.

The accompanying illustrations show in detail a tank of 2,500 gallons capacity for a switching engine with 18 × 24 cylinders, designed by Mr. T. L. Chapman, late Superintendent of Motive Power, for the Chesapeake & Ohio Railway.



DRAW-BRIDGE LOCK, PENNSYLVANIA RAILROAD.

Section Back of Wedges.

The engravings are reproduced from working drawings, and show very clearly the construction of the tank, which is a good example of locomotive practice. The tank is well stayed and braced throughout, and the number of check plates appear to be sufficient for a tender of this form, where the sloping back diminishes the quantity of water in the rear of the tank, and consequently lessens the effect of the forward surge of the water when the brake is suddenly applied.

The main tool box is placed at the rear end of the tank and a box for oil cans and small tools is recessed into the upper part of the tank so that very little shows above. While this arrangement conduces to neatness of appearance, the position of the box renders it somewhat liable to be damp.

The tender frame and trucks are precisely similar to those used for tenders for other classes of locomotives on the Chesapeake & Ohio.

The accompanying list of plates and angle irons, etc., gives in detail the iron required for the tank, and will doubtless be useful to many of our readers.

BILL OF IRON FOR ONE TANK.

Plates.

	Sheets.	Iron.	Ft.	In.		Ft.	In.	
Top	2	No. 4	2	3	×	7	7	Round end.
Top	1	No. 4	4	1½	×	7	11	
Top	1	No. 4	7	4	×	8	0	
Top	2	No. 4	1	3	×	9	6	Flange.
Bottom	2	No. 4	2	3	×	7	7	Round end.
Bottom	2	No. 4	5	4½	×	7	11	
Sides	2	No. 6	3	5	×	16	1	
Sides	2	No. 6	3	5	×	10	6	
Sides	1	No. 6	3	5	×	5	3	
Splashers	6	No. 6	1	3	×	2	1½	
Wells	2	No. 6	1	9	×	2	9	
Boxes	2	No. 6	1	5	×	2	5	
Boxes	1	No. 6	1	2	×	8	4	
Boxes	2	No. 6	0	6	×	2	8	
Boxes	2	No. 6	1	0	×	2	8	
Boxes	1	No. 6	1	8	×	4	9	
Boxes	2	No. 6	1	8	×	2	0	
Boxes	1	No. 6	1	8	×	5	3	
Hood	2	No. 6	0	8	×	6	0	
Hood	1	No. 6	0	8	×	6	0	
Water hole	1	No. 6	1	0	×	5	0	Flange.
Water hole	1	No. 6	1	10				Diameter.
Floor cover	1	No. 6	3	5	×	10	0	

Angle, Brace and Tee Iron.

Bars.	Angle iron. In.		In.	Long. Ft.	In.
2	2½	×	2½	14	0
5	2½	×	2½	10	0
2	2½	×	2½	6	0
1	2½	×	2½	12	0
1	2½	×	2½	8	6
2	2½	×	2½	7	0
2	2	×	2	8	6
2	2	×	2	8	0
4	1½	×	1½	2	0
1	1½	×	1½	6	0

Bars.	Brace iron. In.		In.	Long. Ft.	In.
4	2¼	×	⅜	7	8
10	2½	×	⅜	2	0
2	2¼	×	⅜	8	1
2	2¼	×	⅜	6	0
2	3½	×	3-16	10	0
4	1	×	1	3	0

Bars.	Tee iron. In.		In.	Long. Ft.	In.
2	4	×	2	13	6
2	4	×	2	10	0
4	4	×	2	6	0
2	4	×	2	2	4
2	4	×	2	5	0
1	4	×	2	4	4
2	4	×	2	7	6

The Heat of Combustion.

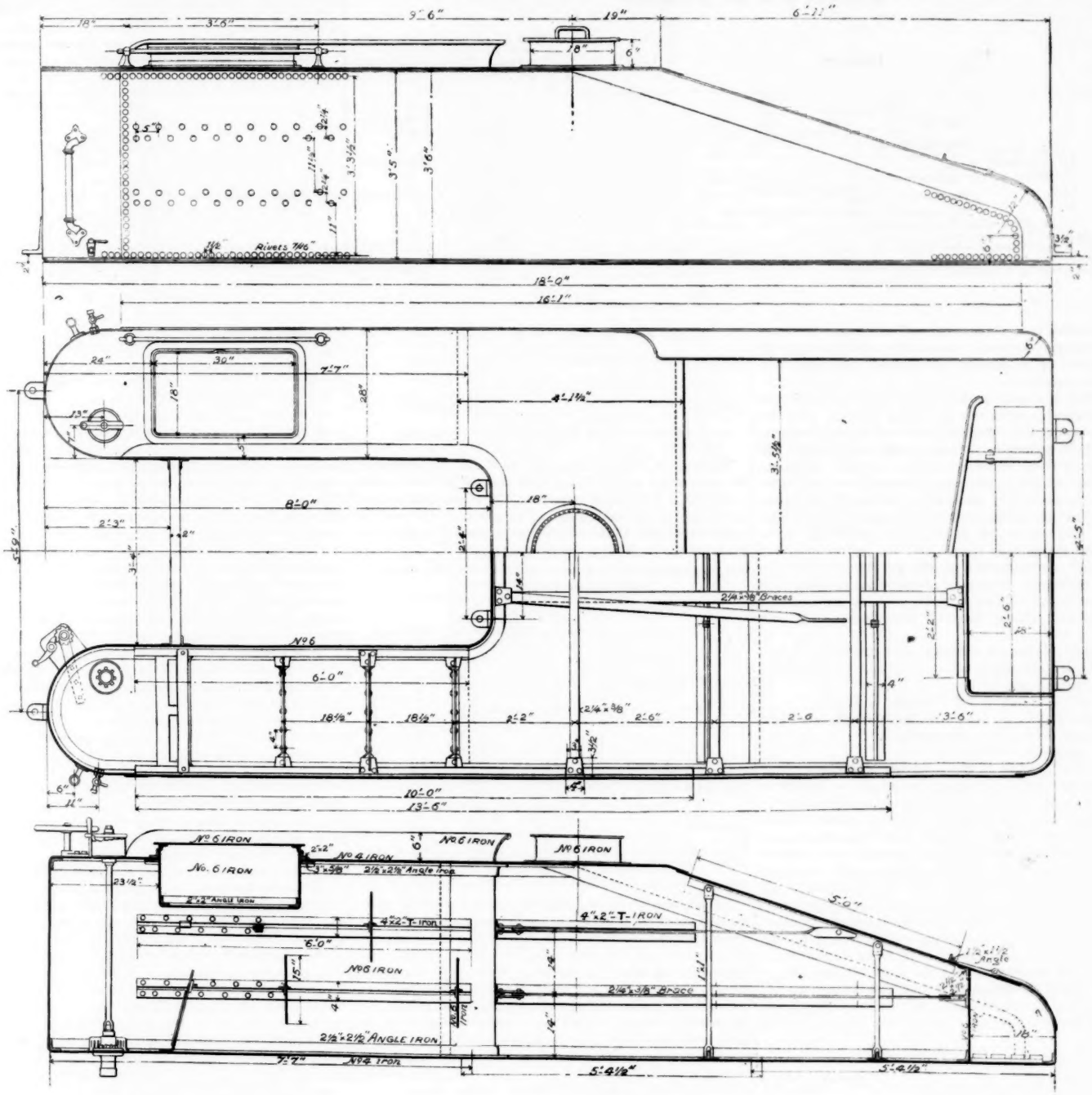
BY RICHARD H. BUEL, C. E.

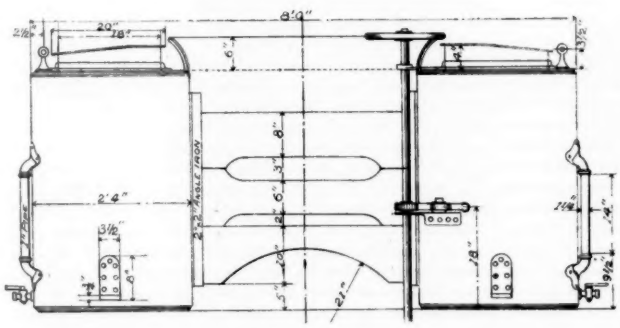
II.

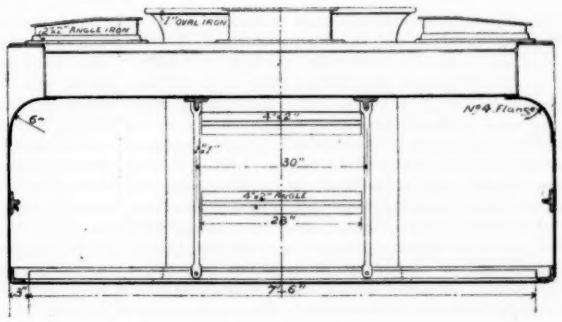
The combustible constituents of ordinary fuel consist of carbon, hydrogen, sulphur, olefiant gas and marsh gas, some fuels (such as the bituminous coals) containing all of these combustibles, while in other varieties (such as the anthracite coals, for example) uncombined carbon is the only combustible constituent of importance. The heating power, in British thermal units, of several varieties of solid carbon and sulphur, and of hydrogen, olefiant gas and marsh gas, in the gaseous state, have been carefully measured, by burning these substances in oxygen, effecting the combustion in a vessel with double sides, the space between the sides being filled with water; so that the heat of combustion was communicated to the water, and determined by the rise of temperature of the water. It was long supposed that the data thus obtained were sufficient for calculating the maximum heating effect which could be obtained by the perfect combustion of any fuel whose analysis was given. Although the experiments to which reference has been made showed clearly that the heat generated by burning a combustible element or compound, was diminished as the density of the compound was increased, little attention was given to this fact in computing the heat of combustion of fuel. Now, in ordinary fuel the carbon exists in various degrees of density, but is usually less dense than the varieties of carbon whose heating powers have been determined experimentally; and the hydrogen, being condensed to a solid form, is much denser than the gaseous hydrogen used in the experiments on heating power. It is a well-accepted fact in chemical science that the decomposition of compound combustibles, and the transformation of solid combustibles into the gaseous state requires heat, which heat must necessarily be subtracted from the total heat of the combustible in a gaseous state in calculating the actual heating power of a solid combustible. It would, evidently, be inaccurate to assume that the heating powers of two varieties of coal having the same chemical composition were identical, if the carbon in one variety was much denser than in the other, or to consider that a hydro-carbon in a solid state (such as the olefiant gas vaporized in burning bituminous coal) would give out, by its perfect combustion, as much heat as would be developed by burning the same substance in a gaseous state.

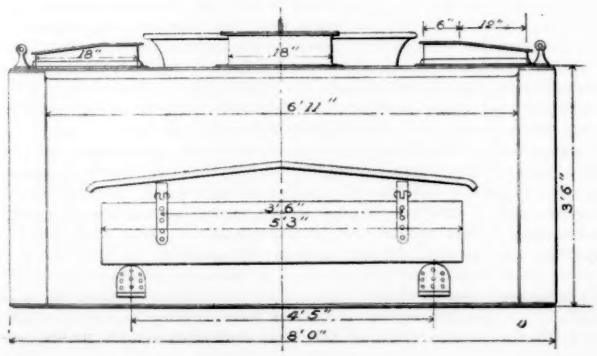
The foregoing statements may be illustrated by an example. Experiments with carbon in the form of wood charcoal show that the heat of combustion, when the carbon is completely burned to carbonic acid, is 14,545 British thermal units per pound of combustible; while if the same substance is imperfectly burned to carbonic oxide, the heat of combustion is only 4,400 British thermal units per pound. Now, as carbon is burned in ordinary practice, the combustion is always complete at first, or 1 lb. of carbon unites with 2.67 lbs. of oxygen, forming 3.67 lbs. of carbonic acid. If the fire is very thick, or the supply of air insufficient, some of the carbon in the coal will be dissolved by the carbonic acid, and the 3.67 lbs. of carbonic acid will unite with 1 lb. of gaseous carbon, forming 4.67 lbs. of carbonic oxide, and giving 4,400 British thermal units per pound of carbon. Should air or oxygen be subsequently supplied, the 4.67 lbs. of carbonic oxide will combine chemically with 2.66 lbs. of oxygen, forming 7.33 lbs. of carbonic acid, and developing 14,545 British thermal units per pound of carbon. From this it will be seen that each pound of carbon in the carbonic oxide, when the latter is burned to carbonic acid, developes not 4,400 British thermal units, as at first, but 14,545 — 4,400 = 10,145. When the carbonic oxide was first formed, as above described, part of the heat was required to vaporize the solid carbon, and since, the heat of combustion per pound of carbon, in British thermal units was: For the imperfect combustion, to carbonic oxide, 4,400; for the combustion of carbonic oxide to carbonic acid, 10,145:—The heat required to vaporize 1 pound of solid carbon must have been 10,145 — 4,400 = 5,745 British thermal units per pound, so that the heat of combustion of gaseous carbon is 14,545 + 5,745 = 20,290 British thermal units per pound.

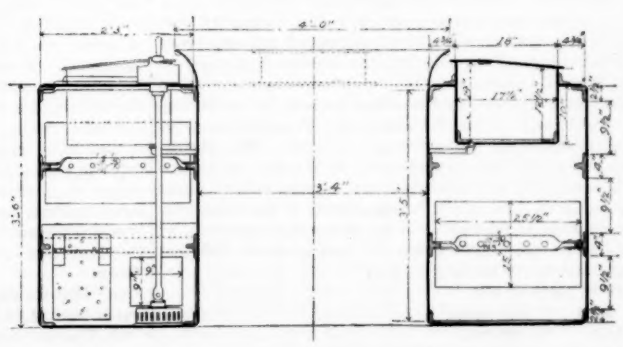
Some additional instances of the effect of the density of











TANK FOR SWITCHING LOCOMOTIVE.—CHESAPEAKE & OHIO RAILWAY.

EXPERIMENTS ON THE HEAT OF COMBUSTION

Substance.				Heat of combustion, British thermal units per pound.	Specific gravity (water of maximum density = 1).
Carbon	Solid, burned to carbonic acid	Charcoal	From sugar	14,472	1.81 —1.85
			" wood	14,545	1.428—2 002
			" gas retorts	14,485	1.885
		Graphite of various degrees of purity.	No. 1	14,061	1.802—2.585
			No. 2	14,014	
			No. 3	14,007	
			No. 4	13,927	
		Diamond	At normal temperature	13,986	3.492—3.5295
			Heated	14,182	
	Gaseous, burned to carbonic acid		Wood charcoal, burned to carbonic oxide	4,400	
				20,290	
Olefiant gas, burned to carbonic acid and water				21,344	
Marsh gas, burned to carbonic acid and water				23,513	
Hydrogen gas, burned to water				62,032	
Solid sulphur, burned to sulphurous acid			Crystallized	4,072	1.898—2.010
			Amorphous	3,991	1.927 - 2.063

the combustible upon the heat of combustion are presented in the accompanying table, which shows the most reliable data obtained by experiments with several combustible elements and compounds.

According to these experiments, the heat produced by the perfect combustion of carbon in British thermal units per pound of combustible varies in round numbers, according to the density of the carbon, between 14,000 and 20,000. The heat derived from burning hydrogen probably varies in a similar manner; and an interesting illustration of the effect of density is obtained by calculating the heat of combustion of olefiant gas and marsh gas from the heat of combustion of their constitutents, as given in the preceding table. Olefiant gas contains per pound .857 lb. carbon and .143 lb. hydrogen, condensed to a specific gravity of 13.96, referred to hydrogen. One pound of marsh gas contains .749 lb. carbon, .251 lb. hydrogen, and is less dense than olefiant gas, its specific gravity referred to hydrogen being only 7.98.

The heat of combustion, calculated from the heat of combustion of the constituents, is:

For the olefiant gas:

$$.857 \times 14{,}545 + .143 \times 62{,}032 = 21{,}336$$

British thermal units per pound, or almost exactly the same as the amount determined experimentally.

For the less dense marsh gas:

$$.749 \times 14{,}545 + .251 \times 62{,}032 = 26{,}464$$

British thermal units per pound, or 26,464 — 23,513 = 2,951 units more than the heat determined by experiment.

The density or specific gravity of the solid carbon, hydrogen and hydro-carbons in coal has never been determined by direct experiment; but the specific gravity and analysis of many varieties of coal have been published and show that the carbon is generally less dense than wood charcoal. This can be illustrated most simply by showing the specific gravity of typical varieties of coal, all of which contain more or less solid, incombustible constituents or ash, with a specific gravity of about 3, whence it can fairly be inferred that in a coal having a less specific gravity than 1.5 (and this is especially true of the anthracites, composed, as they are, almost entirely of carbon and ash), the carbon is less dense than wood charcoal, and has, consequently, greater heating power.

SPECIFIC GRAVITY OF COAL.

	Variety.	Specific gravity.
Anthracite	Pennsylvania	1.32 to 1.70
	Rhode Island	1.81
	France	1 34 to 1 46
	Ireland	1.39
	South Wales	1.26 to 1.36
Bituminous	Maryland	1 31 to 1.43
	Pennsylvania	1 28 to 1.44
	Virginia	1.28 to 1.45
	Foreign	1.25 to 1.52

Although the facts here recited were perfectly familar to engineers and scientists, the practical application of these facts—the inaccuracy of assuming that the heat of combustion of a fuel is the sum of the heating effects of its combustible constituents, as given in a preceding table, independent of the degree of condensation of these constitutents—does not seem to have excited much attention until direct experiment had demonstrated the falsity of this theory; and in spite of these experiments many authorities continue to calculate the heat of combustion according to the old and incorrect method. The *Bulletin de la Société Industrielle de Mulhouse* for 1868 and 1869 contained the account of some elaborate experiments on the heat of combustion of numerous varieties of coal by Messrs. Scheurer-Kestner and Meunier-Dollfus. These experimenters used an instrument called a *calorimeter*, substantially similar to that employed in measuring the heat of combustion in the former experiments, the results of which have already been detailed; but, instead of testing the heating power of the elementary constituents of the coals, they burned samples of the coals in the calorimeter, and measured the heat of combustion. Before commencing their experiments with the coals, they measured the heat of combustion of wood charcoal and hydrogen gas, obtaining about the same results as did the earlier experimenters. The data obtained with the coals indicate that, in general, the heat of combustion of a given variety of coal is greater than is found by taking the sum of the heating effects of its combustible constituents, as determined by the earlier experimenters. As an example, the Friedrichsthal coal may be cited. This coal contained, in 100 parts by weight,

67.81 parts carbon.
4.19 " hydrogen.
13.8 " oxygen.
14.2 " solid and volatile incombustible matter.

Calculating the heat of combustion of this coal by the supposed heating effects of its constituents, and recollecting that the hydrogen must be diminished by ⅛ of the weight of oxygen, so that the hydrogen in this case is $.0419 - \frac{.138}{8} = .0246$:

Carbon	$.6781 \times 14.545 =$	9,863
Hydrogen	$.0246 \times 62{,}032 =$	1,526
Total calculated heating effect per pound, British thermal units		11,389

The heat of combustion per pound of coal, as determined by experiment, was 13,061 British thermal units, or 13,061 — 11,389 = 1,672 units more than the amount determined by the preceding calculation. The general results of the experiments with all the coals whose elementary analysis was made are shown in the accompanying table:

HEAT OF COMBUSTION OF COAL AS DETERMINED BY MESSRS SCHEURER-KESTNER AND MEUNIER-DOLLFUS.

Kind of coal.		Heat of combustion, British thermal units per pound of coal.		Difference.	
		By experiment.	Calculated by formula for heat of combustible constituents.	British thermal units.	Per cent. of calculated heat.
Ronchamp	No. 1	13,836	13,607	229	1.68
	No. 2	12,689	12,082	607	5 02
	No. 3	14,090	13,147	943	7.17
	No. 4	13,159	12,580	579	4.60
Duttweiler		13,269	12,199	1,070	8.77
Altenwald		12,969	11,953	1,016	8.50
Heinitz		13,100	12,003	1,157	9 64
Friedrichsthal		13,061	11,389	1,672	14.69
Louisenthal		12,369	10,687	1,682	15.74

The account of the experiments, which are briefly summarized above, is a model of engineering literature, the description of the apparatus employed, the manner of making the tests, and all the data being furnished, so that the conclusions can readily be checked. Within a recent period, Messrs. Scheurer-Kestner, and Meunier-Dollfus have repeated their original experiments, adding some refinements suggested by experience, and have obtained substantially the same results as at first. As a general conclusion to be derived from their experiments, it may be stated that *the elementary analysis of a fuel gives little idea of its heating power;* since two varieties of coal of similar chemical composition, frequently have very different heating effects, and the *only correct method of determining the value of a fuel is by direct experiment*. This fact is familiar to practical men, who often find that one coal is much more economical than another, even although the latter is shown by analysis to contain a larger percentage of combustible material.

Prof. Walter R. Johnson, in his valuable "Report on American Coals," suggests that it may be found by further experiment that the heating effect of coal is proportional to the amount of carbon which it contains. He gives a few experiments which apparently sustain this view, and the foregoing guarded opinion has frequently been quoted in treatises on combustion and engineering papers as an established fact. The experimental fact already stated—that the density of the carbon in coal affects its heating power materially—is directly antagonistic to this theory, and since Prof. Johnson was a very careful experimenter, it may be useful to examine his data and see whether the theory which he announces can fairly be deduced from the results. The report in question is so fully detailed that all conclusions can easily be checked. Six varieties of coal were submitted to elementary analysis, so that the total amount of carbon, fixed and volatile, was determined, and the heating effect of this carbon—on the supposition that the complete combustion of one pound of carbon would develop 12,906 British thermal units—was calculated. The results so calculated were compared with the experimental results obtained by burning these coals in the furnace of a boiler, the experimental results being the heat measured by the evaporation of water, plus the heat carried off by the products of combustion. The comparison indicating the practical identity of the two results in each instance was assumed to be confirmatory of the theory as stated by Prof. Johnson, "that the weight of carbon alone in coal is the only available element of its heating power.' Two important facts were overlooked in reaching this conclusion:

1st. That the heat of combustion of the carbon in the coal was at least 14,545 British thermal units per pound.

2d. That the heat measured by burning the coal in the furnace of a boiler did not give even a rude approximation to its total heating effect.

An application of the correction indicated by the first of the foregoing statements will destroy Prof. Johnson's theory completely, as illustrated in the table below.

PROF. JOHNSON'S CALCULATION OF HEATING EFFECT, FROM ULTIMATE ANALYSIS OF COALS.

Kind of coal.	Heating effect, British thermal units per pound of combustible.		
	By experiment, being the heat of evaporation plus the heat in the products of combustion.	By calculating the heat of combustion of the carbon contained in the coal.	
		Assuming that the heat of combustion of a pound of carbon is 12,906 units.	Assuming that the heat of combustion of a pound of carbon is 14,545 units.
Cannelton, Indiana	9,844	9,794	11,004
Scotch	10,542	10,705	12,027
Clover Hill, Virginia	10,853	10,758	12,087
Newcastle, England	11,225	10,802	12,175
Midlothian, Virginia	11,804	12,083	13,575
Cambria County, Penn.	11,896	11,868	13,333

If the heating effect of the hydrogen contained in these coals were added to the calculated heating effect of the carbon, the difference between the experimental and calculated results would be still more marked. But the foregoing illustration is probably sufficient to convince the reader that Professor Johnson was deceived by an accidental coincidence resulting from the use of an erroneous constant in calculating the heating effect of carbon. In the second set of experiments by Messrs. Scheurer-Kestner and Meunier-Dollfus, the lowest experimental result was obtained from a coal containing the highest percentage of carbon, and the best result from a coal in which the weight of carbon was 8.2 per cent. less than in the preceding.

According to these experiments, *an elementary analysis of fuel furnishes no trustworthy data for calculating it maximum heating effect*, and, indeed, *nothing but an actual experiment made by burning a sample of the fuel in as calorimeter will give accurate results.*

The Telegraph in Congress.

The bill which the Senate has passed with respect to the use of telegraph lines constructed along railroads which have received bonds or land subsidies from the general government, provides that existing contracts between certain of these roads and the Western Union Company, under which the latter company is given exclusive control of all telegraph business over the lines of these roads, shall be at once cancelled and that the railroad companies shall forthwith operate the telegraph lines which they own on their own account and shall make rates which are just and uniform to all competing companies and make no discriminations between competing telegraph companies which desire to use their lines as a means of connection between the Atlantic and the Pacific coasts. Mr. Anderson, of Kansas, introduced in the House early in the session the bill which passed the House, and which, with some slight amendments proposed by the Interstate Commerce Committee, has now passed the Senate. This bill in effect places the entire telegraph system which runs along the line of all railroads subsidized by the government under the jurisdiction of the Inter-state Commerce Commission.

The bill "to regulate commerce carried on by telegraph," reported to the Senate by Senator Platt, of Connecticut, includes in its provisions all telegraph lines doing an inter-state business. It provides that all charges made for telegraph service shall be reasonable and just, and discrimination between persons or places is prohibited. The bill further provides for publicity of rates, and forbids pooling. The telegraphs are put under the jurisdiction of the Inter-state Commerce Commission. The Commission is authorized to require annual reports from telegraph companies subject to the act, to fix the time and prescribe the manner in which such report shall be made, and to require from such companies specific answers to all questions upon which the Commission may need information. Such annual reports shall show in detail the amount of capital stock issued, the amounts paid therefor, and the manner of payment for the same; the dividends paid, the surplus fund, if any, and the number of stockholders; the funded and floating debts and the interest paid thereon; the cost and value of the company's property, franchises and equipment, the number of employés and the salaries paid each class, the earnings, the amounts expended for improvements each year, how expended and the character of such improvements; the earnings and receipts from each branch of business and from all sources; the operating and other expenses; the balances of profit and loss and a complete exhibit of the financial operations of the company each year, including an annual balance sheet.

Such reports shall also contain such information in relation to rates or regulations concerning recovery, transmission and delivery messages or agreements, arrangements or contracts with other telegraph companies as the commission may require; and the said commission may, within its discretion, for the purpose of enabling it the better to carry out the purposes of this act, prescribe (if in the opinion of the Commission it is practicable to prescribe such uniformity and methods of keeping accounts) a period of time within which all telegraph companies subject to the provisions of this act shall have, as near as may be, a uniform system of accounts and the manner in which such accounts shall be kept.

Rodgers' Ballast Car and Plow.

The ballast car and plow shown in the illustrations have been largely used on the railroads of New Zealand, where it has been adopted by the government for new construction and in maintenance. Mr. J. Henry Lowe, Engineer of Working Railways of New Zealand, writing under date of May 30, 1887, says:

"The ballasting on the railways of the South Island of New Zealand, some 1,027 miles, is now entirely carried on by ballast trains equipped with self-emptying hopper wagons. These wagons are filled by hand labor in the ballast pits, and thence run by locomotive to any point required. The ballast is discharged by simply opening the hoppers, the train is slowly drawn along, discharging as it goes the regulated quantity.

"A plow or ballast spreader is fitted on the break van at the rear of the train, and it spreads the ballast, at the same time leaving the track in running order. No hand labor whatever is used in the operation of discharging. The advantages are rapidity and regularity of discharge, the track is left much neater than by hand labor, and last but not least the traveling of men to discharge the ballast is entirely saved. The number of laborers required to man the train is reduced by half, and the number of trips the train makes in the day is increased by the dispatch in discharging, so that the saving is very considerable.

"Where gravel ballast is used the cost of ballasting is so greatly reduced that both the ballast plow and self-emptying hopper wagon cannot fail to be appreciated wherever economy is studied. They are equally suitable and advantageous for use, whether on construction of new railways or the re-ballasting of lines open for traffic wherever such is required."

The plow and car are described as follows:

Fig. 1 is a side elevation, and fig. 2 a cross section of the hopper body mounted on the frame of an ordinary car of the country. At the bottom of the hopper is a hinged door controlled by the lever shown. Hinged side doors are also arranged above, to drop when loading. The bottom of the hopper is placed low enough to prevent the discharge of too much ballast.

Figs. 3 and 4 are side elevation and plan of the plow fitted to the "brake van" or caboose at the tail end of the train. The plow is intended to spread and level the ballast. As will be seen, it has a double mold board to spread its ballast to the desired width. The plow is hung by links connected to the screw and hand wheel above, so that it can be raised or lowered. When it is in use it barely touches the top of the rail. It is further controlled by a link attached forward and by the inclined guides attached inside of the mold boards. The lower edge can be so shaped as to spread the ballast to the level of the tops of the ties, inside and outside the rails if desired.

Further particulars may be obtained from Messrs. Henry W. Peabody & Co., 70 Kilby street, Boston, where working models may also be seen.

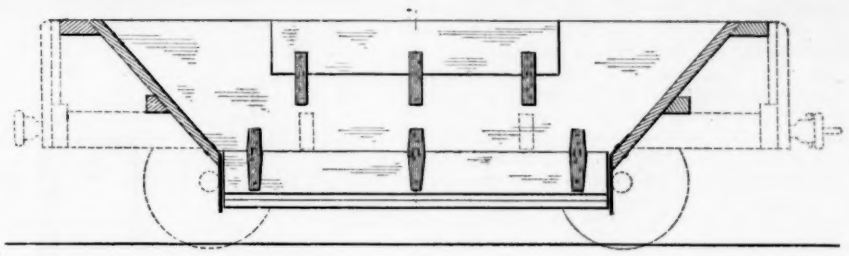


Fig. 1.

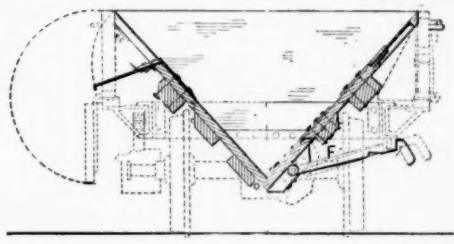


Fig. 2.

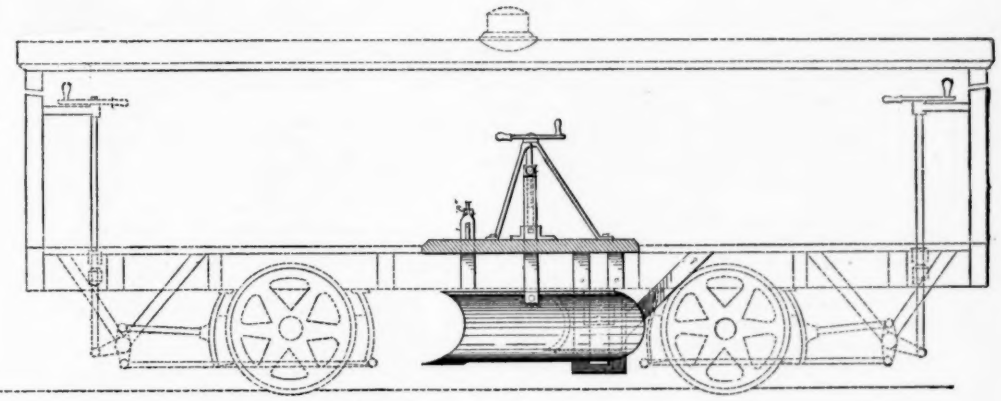


Fig. 3.

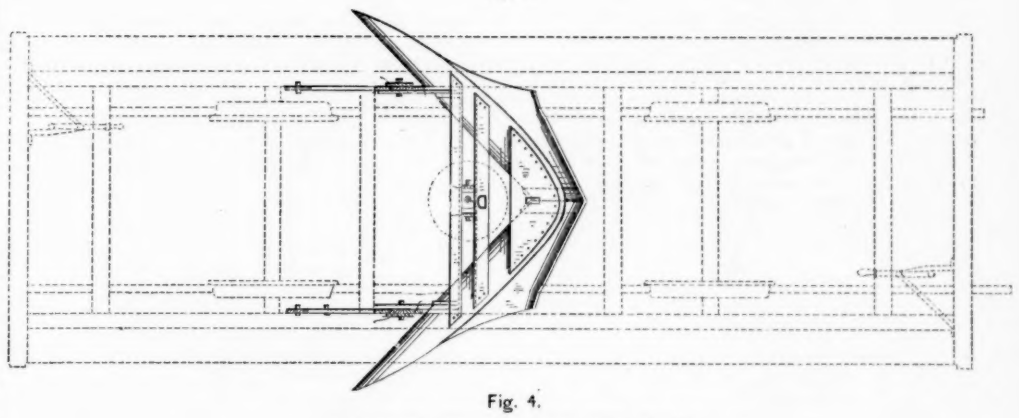


Fig. 4.

RODGERS' BALLAST CAR AND PLOW.

Interlocked Switches and Signals.

BY CHARLES R. JOHNSON, C. E.

IV.

JOHN IMRAY'S MACHINE.

John Imray, No. 1,354, *May* 3, 1872.—The principle of this machine is catch or preliminary locking of a type closely allied with the Saxby & Farmer. Horizontal hollow rocking shafts work in bearings fixed on the upper side of the top plate. These rockers coincide with the stroke of the lever working through a longitudinal slot in the rocker, and the slot has a recess at each end which engages with the lever and holds it in position when the catch handle is released at the end of the stroke, the well known segment and catch being dispensed with. The rocker has right and left hand lips at the back and front end of lever stroke respectively, which engage in turn with a cross on the end of the spring catch rod, thus performing the consecutive rotations of the rocker to do the locking and unlocking. The rocker has an extension in front of the lever, which carries short slotted arms engaging with studs mounted on locking bars, and these bars carry projections engaging and disengaging with slots in the periphery of the other rocker extensions. There are various modifications of this machine made by engineers in England and America, but although bearing the names of the makers they do not vary in principle from the invention of Mr. Imray.

MACKENZIE, CLUNES & HOLLAND MACHINE.

This machine may be described as "hook locking" and is of the lever locking type. There are two shafts, one carrying the dogs and the other the drivers, placed before and behind the line of levers respectively. The dogs are in the form of curved hooks, the hooks engaging with studs on the levers at certain times, and the shank, which is curved and radial to the lever centre, is held by the stud in the locked position at any portion of the lever stroke. The dogs are the full length of the lever stroke and are balanced by counterweights. The drivers are centred on the shaft behind the levers and are in the form of slotted links acting eccentrically to the lever centre in such manner as to have active motion at the beginning and end of lever stroke and a silent intermediate action. The motion of the drivers is communicated to the locking and releasing dogs centred on the shaft in front of the line of the levers by connecting rods and rocking shafts running in a horizontal plane in suitable bearings. In the early machines of this pattern all the locking connections are beneath the top plate, but in recent and improved machines the rocking shaft connections are carried above the top plate and in front of the lever.

R. C. RAPIER'S MACHINE.

This machine is manufactured by Messrs. Ransom & Rapier, of Ipswich, England, and is adapted to both lever and preliminary locking. The locking bars are carried in a framework facing the signalman, and are arranged in a circle or arc thereof. The bars have notches or dogs to engage with notches or stops of the periphery of a sector struck from the same centre as the bars. The dogs and sector notches are matched, so that the inventor can crowd a great many bars together, at the same time insuring safety against a dog entering the wrong notch. The sector of course approaches the complete circle in proportion to the number of locking bars. In the preliminary action type of this machine the bars are moved by hand to perform the locking and releasing, proper projections being affixed to the bars for that purpose. In the lever locking form the bars are driven by motion plates carried on the periphery of the sectors and engaging with studs screwed on to the lock bars. The distinct feature of this machine is the arrangement of locking bars in a circle or any arc thereof.

THE JOHNSON MACHINE.

The Johnson machine is thought to combine the best points of earlier machines, its new features being the movable rocker and the arrangement of special locking. Special or complex locking is much more used now than formerly through the introduction of appliances by means of which one lever is made to do the work of two, three and sometimes even four. The latest design of this machine is so arranged that every facility is given for alterations or additions, and so that one part can be taken out without disturbing another. A tappet can be taken out without disturbing locks or bars; a locking dog can be taken off without disturbing tappets or bars, and bars can be taken out without disturbing tappets and upon releasing the locking dogs that are upon it. This result has never been attained on any other machine. The other main features of the machine are that the locking is on Stevens' principle, the preliminary movement is that of Saxby & Farmer, and the handle is that of the London & Northwestern. An illustrated description of this machine will shortly be published.

THE FACING-POINT LOCK.

Interlocking machines were a great convenience, but a source of some danger until the facing-point lock was invented by Mr. Edwards and introduced by Messrs. Saxby & Farmer. The facing-point lock is an appliance by means of which a bolt is inserted into a hole formed in the front rod of the switch, to which it is attached and so arranged as not to enter until the points of the switch are close home to the stock rails on one side or the other. Attached to the same movement is a detector bar, hinged on clips fixed to the rail, and so arranged that its movement either for locking or unlocking cannot take place while the wheels of a car or engine are in such a position that the movement of the switch would cause a derailment. The object of the facing-point lock, therefore, is to insure that a switch shall be properly home and locked there before the signal to move over the switch can be given, and that the signal must be put to danger again before the switch can be moved, and this cannot be done while a car is standing on it or running over it. For many years the simple facing-point lock as above described was deemed sufficient. It was discovered, however, that one weak spot existed. If a switch set and locked say for the main track is required to be changed to the branch track, the order of movement is to first unlock the switch and then throw it. Suppose now the connections to the switch become dislocated in any way, the operator throws his switch lever, but the switch does not move. The operator will then again pull over his facing-point lock lever and lock the switch (as he supposes set for the branch). He can then lower his branch signal for a train which would run

not on the branch but on the main line, and into any train that might happen to be on the main line. This very circumstance actually occurred recently, and only a few train lengths prevented a disastrous collision between two passenger trains. The difficulty and danger have been overcome, and duplex facing-point locks invented which insure that no matter how the connections may be tampered with or dislocated, a signal can only be given when the switch and lock are both in their proper positions. Only a very few of these duplex locks have as yet been used in this country.

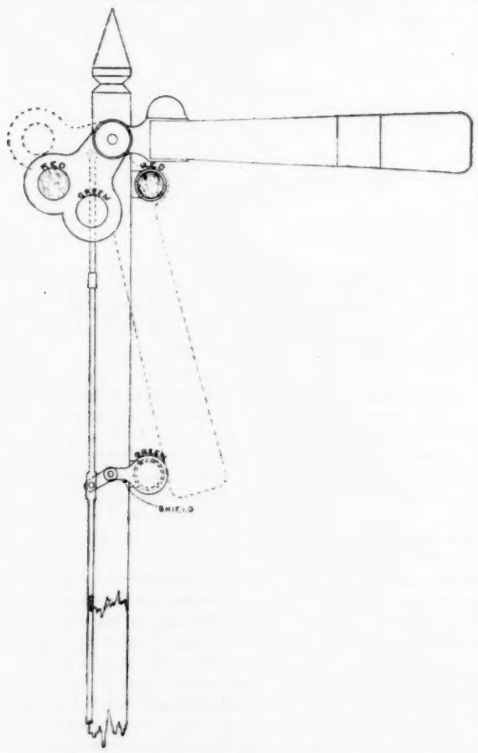
A great many kinds of detector bars are in existence, and the majority do their work fairly well, but there is still room for a bar that will work easily; be certain to stop the action of withdrawing the locking bolt while a train is on the switch; be difficult to break or damage, and not become useless through clogging by snow, ice or sand. The facing-point lock is never perfect unless fixed to an iron plate on the tie long enough to have lock, rails, rail braces, iron plate and tie all bolted together. When this is done the lock is always good, no matter how much the track may be moved.

Signal inspectors will do well to frequently examine facing-point locks to see that the holes in the front rod have not been tampered with. A very simple and rapid test is to place a piece of iron, one-eighth of an inch in thickness, between the switch tongue at the point and the rail, and then try to insert the bolt by having the lever pulled. If the bolt will enter the hole in the front rod, the hole is too large and a new front rod should be put in, or the old one altered to suit. The end of the plunger bolt should be square and not tapered, as is frequently done as a matter of convenience. If the switch is not properly home the bolt should not be able to enter, as its object is to hold the switch in position and not attempt to force it into position. Facing-point locks are too frequently taken as being in good order because they look so. Periodical tests are necessary to insure that the holes are correct, and also that the detector bar cannot be raised while a train is standing on the switch.

SIGNALS.

Notwithstanding the most persistent efforts to substitute some other form of signal, the semaphore signal is practically the standard to-day and is likely ever to be so. Disks and banners of various designs have been tried in all countries and by almost all roads, but all, with very few exceptions, have been displaced by the semaphore. It is so well known that all that need be said here is to describe the various methods in use for displaying the signal at night. The usual method for all stop signals, which include home, junction, starting, block and siding signals, is one red light for each blade when it is at "danger," and one white light when it is at "all clear." Distant signals show green for "caution" and white for "all clear," and by day are distinguished by having the blade forked.

A very perfect position signal is in use on the Boston & Albany and Old Colony railroads, but here although the signal is constructed in exactly the same way on both roads, one uses two white lights as a stop or danger signal, and the other two red lights, both, however, showing horizontal for "danger." The accompanying sketch will show the signal in its "danger" and "all clear" positions. This signal can-

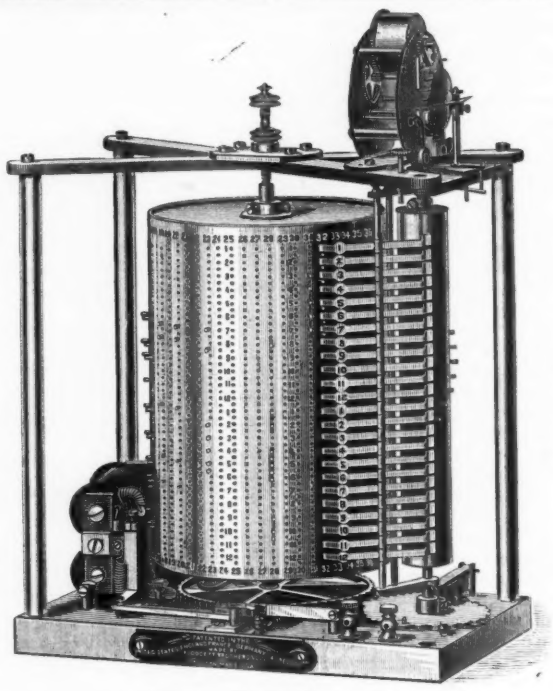


never give "all clear" lights unless the blade is at "all clear," and the lamps properly fixed, and no matter what glasses may be broken or lamps displaced the signal cannot be misunderstood.

A matter that is attracting some attention now is the best way of indicating fast and slow routes with the least complication. The usual method now in use is to have blades of a uniform size on a post, one being for each track to which a train can be turned from the track for which the signal is intended. There are two objections to this, one being that where several blades are on a post it necessitates the post being very high, and another and far more important one is that enginemen are sometimes in doubt as to which blade is for the fast running route, for there is scarcely ever more than one at any junction. This difficulty is overcome by having the top blade always for the fast running track; but when that is done the very excellent rule cannot be applied which makes the top blade of a signal for the track to the extreme right, and the next for the next track in order and so on. The writer introduced on the Boston & Albany the principle of having a large blade for the fast running track and a small blade or blades for the slow route or routes. At night the distinction was equally plain, for the small blades were illuminated, while the large one had the usual lights. Thus when an engineman is running at 60 miles an hour, he cannot for an instant be in doubt as to whether a signal is for or against him. The only objection raised to this system is that the illuminated blades cannot be seen at a sufficient distance at night, but this is a difficulty that can be overcome when necessary. On the road where the system was introduced no difficulty has been experienced.

An equally simple and perhaps more convenient method of giving a signal for every route is not to have more than two blades on a post for a main running track, the top blade to be in every case for fast running. If it is desired to further distinguish this blade it can readily be done. The lower blade will be for the slow route or routes, and these in their turn are distinguished by a number or letter equally well seen by day or by night, and which will only be shown when the signal is at "all clear." For siding and shifting signals only one blade and lamp is required, the indicator showing in front of the lamp when the signal is lowered to "all clear." This system of indicating numbers gives great satisfaction, and it is to be hoped it will be uniformly adopted. The construction of semaphore signals should always be such that the arm will be taken to the danger position when connections are broken at any point between lever and blade.

For shifting and siding movements, pot or disk signals have been used, but recently dwarf semaphore signals have to a considerable extent taken their place, and they are thought to be better and are certainly more consistent.



Blodgett's Electric Signal Clock.

Blodgett's Electric Signal Clock.

The problem of dispatching 50, 60 or 100 trains a day from a station, exactly on time, is not so simple as it may at first sight appear. Giving the signals for these trains to start is frequently put in the charge of the ticket agent, who, besides selling tickets, answering questions and making change, must strike the bells for the departure of each train. It is no wonder, then, that they are given irregularly, or occasionally omitted altogether. Even where this part of the business is done by a person specially detailed for the purpose, the errors are greater than would be supposed, and call for radical improvement.

It would probably be impossible, even for the ingenious inventor of the automatic machines, now well known, into which you can put a coin and draw out a stick of chewing gum or a Winchester rifle, to contrive a machine which would sell tickets, answer questions, or make change; but the following is a description of a machine which gives automatically the signals for the departure of every train in order, according to the time-table in use.

The essential principles of this apparatus are briefly these: The standard clock at the station is caused to close an electric circuit, in a well known way, once each minute. This vitalizes an electro-magnet, which, by means of a pawl and ratchet wheel of 60 teeth, gives motion to a vertical cylinder 6 in. diameter and 8 in. high, and causes it to make one complete revolution every hour. This cylinder is pierced with 24 rows of holes with 60 holes in each row; there is, therefore, a hole for each hour and minute of the day and night. Near this cylinder and at one side is a smaller one, furnished with 24 pins set in a spiral around the circumference, the spiral making one complete turn in the length of the cylinder. Between the two cylinders, and nearly tangent to each, is a vertical frame carrying 24 levers, each of which engages in turn with one of the pins in the smaller cylinder.

The time-table is set up on the larger cylinder. Since most railroads require two signals for every train—a preliminary signal given 2, 3, or 5 minutes before the train goes, and a departure signal sounded the exact moment it should start—all these signals are provided for in this instrument by inserting a short brass pin in those holes which correspond to the hour and minute when a signal should be given.

The larger cylinder makes a revolution each hour, and by means of a cam on its axis, moves the smaller one a space ahead, so that this latter makes one revolution in twenty-four hours. During each hour the rear end of one of the levers in the vertical frame rests on a pin in the small cylinder, and the front end of the same lever traverses the corresponding row of holes in the large cylinders.

The next hour the next lever comes into use, and so on through the series. If, while the rear end of a lever is supported on a pin in the small cylinder, the front end passes over a pin, the lever, and with it the frame in which it is pivoted, is moved a little distance away from the cylinder, and by means of a rocking shaft releases clock work, which, by means of a wheel with certain contact points in its periphery (in something the same manner as in a fire-alarm box), closes an electric circuit a definite number of times, and strikes the preliminary signal on the bells. After the lapse of the proper number of minutes, the lever passes a second pin, and the departure signal is sounded. The warning and departure signal for every train are given in like manner.

The frame carrying the 24 levers is supported on the edge of a cam having seven teeth, which is moved forward one tooth each day. A portion of the rim is cut away, and at midnight on Saturday the frame drops into this depression far enough to bring the 24 levers opposite intermediate rows of holes in the larger cylinder, on which the *Sunday* time-table is set up. On this day, therefore, the bells strike only for Sunday trains, and the week-day time-table is inoperative. At midnight Sunday, things are restored to the former condition for six days more. The machine is thus completely automatic, only requiring winding once a week, like an eight-day clock.

When the time-table changes the pins in the large cylinder are moved to the holes which correspond to the new times of departure of the trains. This can be done in a very few minutes, and the machine is then set till the time-table changes again.

This machine has been in use since 1882 or 1883 at most of the depots in Boston, and does its work with perfect satisfaction. One has recently been placed at the Union Depot in Worcester.

A marked improvement has taken place in the punctuality of passengers taking trains at stations where this instrument has been used. Formerly a belated passenger trusted to the humanity or timidity of the official not to strike the signal till he got aboard the train, but now it is out of his control, and passengers must be on time or lose their trains. They quickly fell in with the new system, and many now set their watches by the signal bells, which are reliable to a second.

An Automatic Time Indicator.

An instrument for the purpose of indicating to engineers the number of minutes which have elapsed since the departure of the last preceding train, and which acts on the same general principle as the devices for the same purpose which have been heretofore described, is now in use on the Syracuse, Geneva & Corning division of the Fall Brook

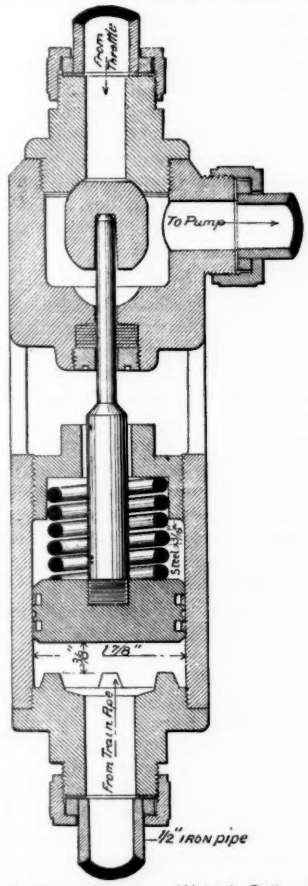
Coal Co.'s Railroad. This road has had one of the instruments in severe service for about a year, and has had 15 of them in service at various points on the main line for some six months, which included the severe weather of last winter, and the performance of the machines has been so satisfactory that the company now proposes to place them at intervals of two miles over the whole division between Corning and Lyons, N. Y.

The principle of the apparatus is very simple: A clock, fixed upon a post, is erected at the side of the road (at any convenient point) at such a height as to be conveniently seen by the engineer sitting in his cab. The face of this clock is round and of the ordinary size, but is perfectly plain being for about four-fifths of its surface the only lettering shown being the figures which show the first 25 minutes after the even hour; that is to say, all figures, except XII, I, II, III, IV and V, are omitted, and the hand, which is a minute-hand (there is no hour-hand), is automatically stopped when it reaches V. It is, of course, unnecessary to show definitely how long a time a train has been gone after ample time has been allowed for safety. The wheel which carries the minute hand engages with another of the same size, which is fixed to the upper end of a vertical arm, whose lower end is pivoted; this arm is connected by a rod with a horizontal rod extending under the rail, midway between two sleepers and the passage of a train or engine over the track depresses this horizontal rod a small fraction of an inch, and has the effect of moving the arm inside the clock which carries the wheel, thereby separating this wheel from that carrying the minute hand; the minute hand, then, whatever position it may be in, is immediately pulled back by a spring to XII.

If the engineman, on reaching the signal, sees the hand fly back to XII, he knows that the instrument is in working order, and that his train is protected even if the clock should run down or stop from any cause. The worst it could do in that case would be to make the interval appear too short, thus being on the safe side. The Fall Brook Coal Company uses no light on the signal, depending at night on the light given by the head light.

Air Pump Governor, Wabash Railway.

Among the various complaints made by those in charge of air pumps is one that the governor controlling the air pump is not positive in its action, allowing an excessive pressure at times, and is constantly getting out of order, thereby causing great trouble and annoyance, as well as expense.



Air Pump Governor, Wabash Railway.

In consequence of these defects in existing means of regulating the pressure in brake pipes, the governor shown in the accompanying engraving was designed and put in service by Mr. J. B. Barnes, Superintendent Motive Power, Wabash Railway.

The pressure of air allowed in the train pipes on this road is 70 lbs. per square inch. The spring in the governor is therefore set to close the passage between the throttle and pump when the pressure has reached 70 lbs. per square inch. The spring is regulated by a nut above it, which can be raised or lowered as the case may be. The upper part of the piston-rod is packed with lead and asbestos, but the piston-rod must not be cramped or bound, as it will interfere with the free action of the governor. All bearing parts must be made very smooth and even.

The accompanying engraving shows the valve as closed. Experience on the Wabash has shown that the valve remains closed but a very short time, the air pump never being entirely stopped.

It has also been found that this governor is very sensitive, the pressure not varying over 1 lb., hence is very quick and positive in its action; and it is, moreover, said to give no trouble at all.

There is no patent on the governor nor any part of it, nor has any application been made for a patent. It is free for the use of any parties who choose to make and use it.

Ruling Gradient.*

How well I remember while yet struggling to master the contents of certain red-covered text-books that what then seemed a grand idea slowly settled itself into the seat of my understanding. I saw how, with one grand effort, the profile of a road was fixed; I saw how, when we had ascertained what grade was practicable over some range of hills, or perhaps across some deep valley, we had fixed the grades for perhaps 100 miles on either side. For having determined the ruling gradient, we should use it wherever it was less expensive than another.

A few years later I was called upon to see what could be done to meet the constant demand for cheaper transportation; and transportation in all its details must be studied. I saw that the operating department was taking advantage of certain peculiarities of the profile, and doing what the locating engineer never dreamed of. From observations while riding on freight trains and while at the dispatcher's desk, I saw the trouble caused by a badly broken profile; and, finally, I saw that my idea of a ruling gradient was a delusion. I saw that in building a road the problem to be solved was how, with a given amount to expend, to make a road which could be operated for less expense than any other that could be built for that amount; and if the amount to be expended was not fixed, to determine how much should be expended to give the best returns in operating profit. * * * Business may be much heavier on some portions of a line than on others. This has great bearing on determining the profile. The business of a line may be accumulative in its heaviest direction; that is, if it runs through a large wheat, coal, lumber or ore region, it will pick up freight so that the amount arriving at one end may be several times as great as that leaving the other. On the other hand, the freight may be distributive in its heaviest direction, as the case of a road which brings coal and raw material from one end of its line to a manufacturing district, especially if the products of manufacturing largely go back in the direction from which the raw material comes, as in the case with most Eastern roads. Likewise, the traffic of a road may be either accumulative or distributive in the direction of its lightest traffic. We may have on a line of road any possible combination of these cases over the whole line or a part of it, and these conditions may change with the season.

If we consider only what has been said above, it will be seen that the relative importance of grades may depend largely upon their location and direction; so much so, that on a road that has only a limited number of empty cars to be taken to one end of the road and picks up loads returning, a grade of 100 ft. to the mile at one end against the direction of empty cars may not be as objectionable as a grade of 10 ft. to the mile against the direction of loaded cars at the other end.

Having made a careful estimate of the probable business of the proposed line in all its particulars for the present and future, you are prepared to take up the study of physical features of the country through which the line is to go.

In studying the expenses of conducting transportation of a road, we will find for a given number of cars transported in each direction, that some of the items of expenses are independent of the number of trains employed to transport this number of cars, while many items are very nearly proportionate to the number of trains, and a very few are increased by diminishing the number of trains. Further, the experience of numerous single track roads has shown that it is rather the number of *trains* that limits the capacity of the road, than the number of *cars*. * * *

Our problem now is to see, with the means at our disposal, how to get a line over which we can get our traffic with the least possible expense; and, as we have seen, this means, in general terms, with the least train mileage, or in other words, with the greatest average number of cars to the train. Every attempt should be made to locate the line so as to get the heavy grades where the tonnage is small. It will be found that it will often pay to spend large sums to avoid a short piece of heavy grade when there are long pieces of level track on either side. You will find if you can get twenty or more miles of low grade in a place, you can double your engines on the hills.

If your line obliges you to go from a certain point in a valley to a gap in a range, it will not usually be policy to lengthen the line to keep down the grade unless it is an extreme case, and the amount of curvature is not increased too much. The least mechanical energy is expended by moving from the base to the summit in a straight line. For every 360 degrees of curvature, you have added work equivalent to raising the same 18 ft.; you also rapidly increase the cost of maintenance.

What may be called a double ruling gradient can often be worked advantageously; that is, a low grade used in as long pieces as possible, and then a grade where one half as many cars can be pulled. * * *

In all questions of grade, the number of engines required in each case should be considered. If grades can be altered to save the service of one engine, you have $8,000 to expend in grading without increasing the total cost of your road and equipment, while you save the perpetual attendant expense of the engine, and probably save in maintenance of way expenses also. There are many roads in operation which have gone on buying engines, when the money spent for these engines expended in reducing some of the grades would save

* Extracts from a paper by Eliot Holbrook, S.B., in the *Technology Quarterly*.

the expense of operating and repairing those engines, and still larger expense as the business increased.

The introduction of couplings without free slack and with power brakes, will remove the objection that has been raised to larger trains in the past. The tendency at present is decidedly for larger trains, and is opposed only by those who have never tried it.

With an example of the application of ruling gradients as it has been used in the past, I will close.

The lower diagram is a representation of the profile of sixty miles of existing road, and the upper one is the same, slightly changed to facilitate traffic. The direction of lightest traffic is from 60 toward 0. A fair estimate will be that one-half the cars are empty between 60 and 40, and that two-thirds of the cars are empty between 40 and 0.

With the heaviest class of engines generally in use, 25 loaded cars can be drawn from 0 to 60, and 50 empties can be drawn in the other direction.

At present the traffic is worked in this way: An engine takes a train from 0 to 7, and returns and takes another train and takes both trains from 7 to 16, when it takes the original train again. One or two trains per day are set off at 30, and are taken away 3 or 4 cars at a time by other trains, as they can draw 3 or 4 cars more through the gaps at 40 and 50 than they can draw from 16 to 28.

With the profile as changed, the operation will be as follows: The double of the train drawn from 0 to 7 would be taken to 19 instead of 16, and would also be taken from 26 to 60. This would require some trains to double, returning between 60 and 56, and between 34 and 30. Now let us suppose that the heaviest traffic is 300 cars per day in each direction, and that the engines make 100 miles per day, let us see what the saving in train miles would amount to.

By the present system.				Train miles.
12 trains each way	between 0 and	7	=	168
6 " "	" 7 "	16	=	108
12 " "	" 16 "	30	=	336
10 " "	" 30 "	60	=	600
Total				1,212

Profile changed.				Train miles.
12 trains each way	between 0 and	7	=	168
6 " "	" 7 "	19	=	144
12 " "	" 19 "	26	=	168
6 " "	" 26 "	60	=	408
Add for 3 trains doubling,	60 "	56	=	12
" 2 "	" 34 "	30	=	8
Total				908

Saving in train mileage 304 miles.

The slight changes in the profile only reduce the mechanical energy required to move a given weight from 0 to 60 three per cent., and the less number of engines required to be moved takes two per cent from the total work of moving the traffic; so we cannot say that we save much in fuel or repairs of engines, as the fewer engines are worked harder on the light grade, but we will save the expense of three crews, or about $50 per day, besides some saving in maintenance of way and telegraph service. At the same time the capacity of the road is increased.

Had the road originally been built on the changed profile, the increased cost would have all been confined to about four miles of grading, and would have been less than $100,000.

To the saving of $50 per day, add the interest on the cost of three engines and the deterioration in value of the same, and we will find that saving in wages and motive power alone will reach twenty-five per cent. on the investment.

In the case of this piece of road, a short piece of the ruling gradient, less than a mile long, was used at miles 17, 18, 28, and 40, and one less than two miles long at 50, with what result we have seen. This is only one case of hundreds where roads are handicaped by engineers who have made no study of transportation matters.

When changing the short steep grades, it may often be done in a manner which will meet the wants of the case, and yet cost much less than to change the whole piece. For example: the total height of the point at 38, above the level on either side is 42 ft., and in our case the engine is able to pull steadily 25 loads up this grade, and we want to pass them with 50. This point being three miles from a station, the train can approach it at full speed when going toward 60. Now since the engine can pull half the train up this grade, we may roughly say that the momentum can be expended on the other half, which would lift it from 20 to 30 ft.; so that for half the distance we may let the grade remain, and change the upper part only to a grade over which a train can pull twice what it can on a 70-ft. grade, or, $\frac{70 + 16}{2} - 16$ equals 27.

If we go into the details of the calculation, it will be found that if the summit is lowered 8 ft., the momentum acquired in moving from 26 will enable the engines to take the trains over without trouble.

The Smith System of Continuous Heating.

Mr. Roderick H. Smith, of New York, has introduced a new system of continuous car heating. The coupling is metallic, no rubber hose and no gasket being used. A ball joint and a swinging pipe joint give universal motion.

The coupling, which somewhat resembles the Westinghouse, comes apart when the cars separate, a slotted link lifting the coupling when the coupling is stretched. Two Bundy radiators are placed in each car, one at each end. The main pipe is placed wholly beneath the body of the car and a trap is placed at its lowest point. A simple rod expansion trap is used, placed in a diagonal position beneath the car. Mr. Smith's system of heating appears to have been carefully designed and merits attention.

Another St. Louis Bridge.

The merchants' terminal bridge scheme has been revived in St. Louis, and some progress has been made in floating the stock. The plan is to build a bridge in North St. Louis across the Mississippi River that will give terminal facilities to several additional railroads now seeking an entrance to the city. A charter for the new bridge was obtained two years ago from Congress, and the city has given all the necessary right of way.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

As we go to press the Association of Railway Accounting Officers is in session in this city, with the object of effecting a permanent organization. We wish the new Association a prosperous and useful life. Certainly there is a great field for it and one in which co-operation may produce the best results.

The Inter state Commerce Commission has just decided another of the Standard Oil cases—that of William C. Scofield *et al. vs.* Lake Shore & Michigan Southern. It differs from the case of Rice *vs.* Louisville & Nashville chiefly in the fact that the action of the railroad authorities was more straightforward. They did not make any secret of their rates, nor did they adopt any "device" to conceal inequality of treatment; but they made a different rate for a given weight of oil in tank cars from that which they charged for car-load lots of barrels. This difference amounted to about three-quarters of a cent a hundred pounds independent of distance, even when no deduction was made for mileage on the tank cars. With such deduction, the owner of tank cars had an advantage of about 20 per cent. over his competitor. No good reason was found to exist for this difference—many of the reasons, in the opinion of the Commissioners, acting in the opposite direction. In the Louisville & Nashville case, it was, we believe, shown that return loads of cotton-seed oil could be had for a large number of the tank cars. Nothing of the kind was alleged in this case. On the whole, the practice of the Lake Shore seems to have been carried on in perfectly good faith, but without good reason; at any rate without sufficiently good reason to make the Commission see it.

A summary of opinions regarding the best wood for the interior finish of passenger cars is given on another page, and indicates that most master car-builders have a strong preference for mahogany. The reasons are given very fully, and are mainly based on the fact that mahogany is a very close grained wood, which does not absorb dirt, and can be readily cleaned and refinished, while it does not crack, warp or twist under exposure to moisture, artificial heat, etc. Other woods, especially oak and ash, are lighter in color and more cheerful, but grow shabby and gray with age, owing to the open grain absorbing dirt. The prevalent style of art decoration undoubtedly favors solid oak and ash, but it would seem possible to employ a combination of these woods that would be durable and yet not too dark or gloomy. It is, however, manifestly inadvisable to employ a wood or elaborate carving that looks well when the car is new but soon gets shabby with time and wear. The body of a car is a tolerably durable structure, and the appearance of the car should harmonize with its durability and structural good condition; but a shabby interior prepossesses passengers against a car otherwise perfectly sound and safe. This consideration has probably induced many car-builders to prefer, for interior finish, a wood which improves in appearance with time, even if it is somewhat gloomy in color. The question of price has, of course, a certain influence, and one master car-builder remarks that he uses bay wood and cherry with mahogany because they are cheaper woods, and when utilized below the belt and for moldings, sashes and doors, the cheaper woods are not easily detected.

Keeping trains apart by some means other than those dependent upon the vigilance of station men or the ability of engineers to graduate their speed with nicety, is receiving increased attention. The cost of rear collisions, if not the disgrace of them, leads wide-awake officers to look very carefully into their causes. The block system is increasingly appreciated and desired, even if by reason of poverty it is not adopted. Some of those who cannot afford this are adopting the next best means. Recently a superintendent enhanced his own confidence materially at a single stroke by directing every section master, bridge-tender, watchmen and other employé stationed between stations, to exhibit a caution signal for a certain period immediately after the passage of each train. This has been done for many years by some roads and deserves the notice of those who have not tried it. Station indicators exhibiting to enginemen the time at which the previous train left are better liked the more they are used. A notable instance of progress in this line is briefly described in another column of this issue. The objections to depending on station men to keep trains properly spaced is that they may forget, and that stations are too far apart; moreover, engineers cannot run exactly to schedule with all sorts of trains, up and down hill, without extraordinary care, and a five-minute interval may be reduced to four without any particular negligence. The one minute difference makes several hundred feet less distance to which a flagman may get back. A station indicator was noticed the other day unchanged after a train had been gone five minutes; and veracious witnesses aver sometimes that half an hour elapses before men in charge of these signals come to their wits and put in the new figures. The device just referred to is designed to obviate these defects. A machine will not forget. This aparatus is cheap and is unaffected by weather, and therefore can be placed at as frequent intervals as may be desired. It can be used on either single or double track. The special points of interest at this time are the cheapness and the good record already made. The principle of the device is old, but the facts that it can be made for a low price and that a careful superintendent had satisfactorily tested it in extended actual practice, are new.

In a late letter to *Engineering*, Mr. C. P. Sandberg calls attention with satisfaction and proper pride to the progress of the "Goliath" rail on the Belgian state railroad. First, 300 tons were laid, then 1,000, and now 10,000 tons of the 100-lb. rail are ordered from Belgian makers, to be put down this year. Mr. Sandberg says that he is told that the experience has already shown not only greater safety and comfort with the heavy rails, but an actual economy of maintenance, sufficient to "repay the extra outlay of the heavier rail." It is anticipated that the cost of maintenance of rolling stock will also be materially reduced. He says further that leading railroad administrations in other continental countries contemplate increasing the weight of their rails by 20 to 30 per cent.

In our own country, while there has been no sudden great change in weights of rails, the progress toward heavier sections is steady. It is shown not only in the sections actually rolled, but in the spread of the opinion that economy as well as safety is to be found in heavier rails. For instance, a committee of the Association of North American Railroad Superintendents some months ago sent out questions to learn the opinions of the members as to the best sections for various traffic conditions. The weights recommended for heavy freight and fast passenger traffic were from 70 to 100 lbs—nothing less; while nothing less than 60 was suggested for "average conditions." At the last convention of the Roadmasters' Association a rail not less than 60 lbs. per yard was recommended, with an increase of 15 per cent. on unballasted roads. These recommendations come from men many of whom are familiar with and are still using 50 and 56-lb. rails; but even in that body the weight of discussion favored a rail heavier than that recommended, from 70 to 90 lbs. in fact. One speaker on whose road a division had been laid first with 50-lb. and then with 60-lb. rails found that the economy of maintenance was sufficient to pay interest on the cost of the extra 10 pounds, and that there were still further benefits, the money value of which had probably not been determined. So far as we can learn these opinions and recommendations are having their natural and legitimate effect. At any rate, the weights of the rails lately ordered show a pretty general, though moderate, increase. The Southern roads, both new and old, have been buying 60 and 65-lb. rails; and one of the old lines, on which fast passenger traffic is becoming an important element of the business, has lately been buying a 70-lb. section. The same increase in weight is going on on the Western lines, and on some of the new lines in the Northwest 70 lb. rails are used. It is a good way from a 65-lb. to a 100-lb. rail or to the 74, 80 and 85-lb. sections of the trunk lines; but the weights we have mentioned replace 50's and 56's, and the increase is an important one—16 to 20 per cent. at least.

The addition of a combustion chamber to a locomotive has been so often proposed and tried only to be abandoned that it is evident that it has some inherent disadvantages. The first and vital disadvantage is that it is, generally speaking, inefficient. The cause was clearly pointed out in these columns last week. The combustion chamber being of small cubic content and some distance from the fire, the gases are cooled by the large surrounding body of water and are not hot enough to combine and make that perfect combustion which is the object of the combustion chamber. This objection is of course incapable of actual proof and will be denied by those who favor the use of a separate combustion chamber. An objection which can, however, be clearly demonstrated is the extra weight and cost entailed by a combustion chamber. Taking an ordinary locomotive boiler for burning soft coal, it is convenient to assume that the space for the combination of gases is too limited and should be increased a definite amount.

Two modes are open; the use of a separate combustion chamber, or an increase in the depth of the fire-box. It will be found that in an ordinary boiler an increase of one foot in the depth of the fire-box will increase the cubic contents about 18 cub. ft., and that the additional weight of the casing, fire box sheets, stays, lagging, water, etc., will be about 1,200 lbs. in round numbers.* The additional heating surface will be about 18 sq. ft.

Taking the same boiler and adding the simplest form of combustion chamber of the same capacity will entail an additional weight as regards the boiler (including water) of 2,800 lbs. As the length of the boiler is increased 2 ft. 3 in., a corresponding increase is necessary in the length of the frames, coupling rods, driving equalizers, running board, reach rod, etc., and these additions may be estimated to weigh fully 1,600 lbs. The account, therefore, stands thus:

	Combustion chamber.	Deep fire-box.
Additional cubic capacity, cu ft. ..	18	18
Additional heating surface, sq. ft...	29	18
Additional weight, lbs.	4,400	1,200

The result gives 11 ft. of additional heating surface, obtained at a cost of 3,200 lbs. of additional weight. At this rate a locomotive with 1,200 ft. of heating surface would weigh 348,800 lbs., so that the combustion chamber as a cheap mode of obtaining additional heating surface is a failure.

It may, of course, be urged that the more perfect combustion and greater heating surface obtained would enable the heating surface in the tubes to be reduced, but more perfect combustion may also be fairly claimed for the deeper fire-box, and therefore any reduction of weight obtained by reducing the length of the flues applies to the boiler with the deep fire-box as well as to that with the combustion chamber. Both give additional heating surface, and the small difference of 11 sq. ft. can hardly be considered important enough to warrant any material alteration in the flue surface.

If a very large combustion chamber is added another objection comes into force, for not only is the weight of the boiler immensely increased, but it becomes so long that it can hardly be handled in ordinary erecting and boiler shops built for the present style of locomotive boiler. The locomotive itself is also materially increased in length, and thus becomes too long for ordinary shops and turntables, which is a serious practical objection in every day working.

The engines of the steamer "Monmouth" briefly described in our last issue, form a striking example of of the relative economy of locomotives and modern marine engines, and lead to some reflection as to the amount of useful work that can be obtained from high pressure steam. The "Monmouth" has twin screws driven by triple expansion engines. The high pressure cylinder of each engine is 19 in. diameter, and therefore differs little in size from

* These figures have been calculated on a boiler for the Michigan Southern & Lake Shore, Figs. 398, etc., *Recent Locomotives*, enlarged edition.

those used on the great majority of modern main line locomotives. The stroke, 30 in., is somewhat longer than usual in locomotives, but the number of revolutions per minute, from 120 to 150, give a somewhat slower piston speed than is usual in locomotives running at a fair speed. The general type of consolidation engines running at 25 miles per hour makes about 165 revolutions per minute, corresponding to a piston speed of 660 ft. per minute, while an express passenger engine running at 50 miles per hour will make about 250 revolutions, corresponding to 1,000 ft. of piston speed. The piston speed of the "Monmouth" would vary from 600 to 750 ft. per minute.

It is obvious, therefore, that with a given cut off the high pressure cylinders of the "Monmouth" will admit in a given time about as much steam as the cylinders of an ordinary modern locomotive. The point of cut off when working hard does not vary greatly in either case, steam being admitted for about 40 per cent. of the stroke, corresponding to a 10-in. admission on a cylinder of 24 in. stroke. The amount of steam admitted to the engines being about alike in each case, it may be useful to compare the work performed. The engines of the "Monmouth" develop about 2,750 indicated horse-power, while it is doubtful if 1,000 indicated horse-power has ever been obtained from an ordinary locomotive running in regular service.

It is obvious that steam can be raised as economically in a locomotive boiler as in a marine boiler, and therefore if the same amount of steam is used we may expect that approximately the same amount of coal is burned, though in one case 1,000 indicated horse power is rarely developed and in the other over 2,700 is obtained in regular work. This leads to the conclusion that as compared with the locomotive the modern marine engine develops three times the amount of useful work from a pound of coal. The same comparison holds good when triple expansion engines are compared with the old style steamboat engines, where boiler pressure is lower, and the expansion is wholly conducted in the single cylinder. The "Monmouth" is stated to burn but 13 tons a day, while her predecessor, the "St. Johns," a somewhat smaller and slower side-wheel boat, burnt 30 tons when doing the same service. The whole of this economy is not due to the compound system, for in comparing the two steamers the superior economy of the screw as a propeller has some influence, though in the shallow draft the difference is not generally supposed to be very marked. When the comparison is made with a locomotive, the fact that a marine engine has a surface condenser instead of a blast pipe makes a difference of fully 15 lbs. per sq. in. on the whole length of the diagram, and this adds considerably to the power developed with the great degree of expansion possible in a triple expansion engine. The compound system does, however, enable a great amount of economy to be obtained even in non-condensing engines, and some further developments in that respect have taken place very recently, and will shortly be laid before our readers.

The Demurrage Bureaus.

The Demurrage Bureau at Denver appears to be in feeble health, if not actually dead. It is not necessary to detail the circumstances which brought about the decline. It is enough to say that they were not unusual. Competition for business tempted one road or another to shirk demurrage collection. There were disagreements about switching charges, and, in short, the rules of the bureau were not lived up to in good faith.

We can but regard the result as a real misfortune. An officer who knows about the workings of the bureau says that it was a success and a benefit to the companies, and its discontinuance entails a quite useless sacrifice of revenue, or increase of expenses, or both. This does not seem just the time for the railroads to gratuitously sacrifice such privileges of co-operation as are left them. The lawmakers interpose enough obstacles to harmony and to the maintenance of profitable rates, and they need no encouragement from the companies themselves. We are very confident that a reasonable system of demurrage charges, reasonably and justly administered, will be found not only profitable to the railroad companies but actually beneficial to most of their patrons as well.

A demonstration of this is now going on at Omaha, where the demurrage bureau, of which we have several times spoken, is still working smoothly, and with results which must surprise those who set it going. This bureau was established Oct. 1, 1887, in accordance with an agreement between the Union Pacific, the Burlington & Missouri River, the Chicago, St. Paul, Minneapolis & Omaha, and the Omaha Belt Railway. The memorandum of agreement was published in the *Railroad Gazette* Jan. 27. It was agreed to make and collect demurrage charges on all loaded cars held at Omaha or South Omaha more than 48 hours after arrival, and the companies bound themselves not to waive or refund demurrage charges except by unanimous consent of the superintendents. A penalty of $300 for each violation of the agreement was fixed, the penalties to go to help pay the expenses of the bureau. We have never heard how far the penalties have gone toward supporting the bureau, but we have heard of very excellent results obtained by it.

In February, the Commissioner, Mr. E. E. Hill, wrote to us (*Railroad Gazette*, Feb. 24) that the switching service was very greatly improved under the new system, and the majority of the consignees had discovered that it was actually advantageous to them as well as to the railroads. They could get their cars set for delivery at once, instead of being obliged to wait indefinitely to get them out of a long string on a storage track. The railroad companies had gained in the first four months about 158,000 days of service for one car, and had saved $5,000 a month in cost of switching engine service. After eight months' experience the bureau was still working smoothly, and the gain in service of cars, the economy in switching, and the prompt delivery of consignments continued.

Undoubtedly such a machine will not work itself. There must have been tact and skill in the management of the Omaha bureau. Concessions and compromises must have been made in special cases, and it is said that the rules have not been arbitrarily enforced against customers when cars have, by the fault of the railroad, accumulated beyond the consignee's capacity to handle them promptly. These, however, are matters of administration and not of principle. If the principle is a good one, and the railroad companies really wish to apply it, there need be no great difficulty in getting the right man to carry on the work. On him, however, the success or failure of the bureau will naturally depend to an unusual degree, for the railroad companies are brought into a new sort of relation to each other and to the public, and these relations may easily be made uncommonly exasperating.

There is reason to think that the Omaha bureau has come to stay, and that it has proved its usefulness to the roads and to their customers; but whatever its fate may be, it has already had enough success to encourage establishing similar bureaus of the same kind at other points. It has shown how a certain serious waste can be saved, and how the profits of transportation can be increased without increasing its cost to the shipper. It goes without saying that one demonstration of this kind is a valuable and lasting contribution to railroad economy.

Mississippi Rates.

The contest between the Illinois Central Railroad and the Mississippi Commission involves important questions of principle. The Commission has prescribed a schedule of rates which the railroad authorities claim to be unreasonably low. The railroad men say that they could not apply the same tariff in other states without financial disaster, and they call special attention to the fact that the Mobile & Ohio, a parallel and competing line, is allowed to charge much higher rates. The Commissioners dispute the first point, but admit the second. They justify the different treatment of the two roads on account of the larger tonnage and earnings of the Illinois Central.

Any detailed comparison of the two systems is difficult, because the operations of the southern division of the Illinois Central are now combined with those of the Illinois lines in the published reports. The length of the two is not widely different—the Mobile & Ohio controlling, at the time of the last issue of Poor's Manual, 687 miles, and the Illinois Central 793 miles south of the Ohio River. The Illinois Central's southern lines are represented by a capital of $28,000,000; the corresponding accounts for the Mobile & Ohio would amount to between $21,000,000 and $22,000,000. The cost per mile of the former is thus considerably greater than that of the latter. But the difference in net earnings far more than makes up for this difference in capitalization, leaving under past circumstances a good profit for the Illinois Central, and very little for the Mobile & Ohio.

Does this give good ground for the Commission to make a difference in rates on the two lines? Let us see what will be the result of so doing as a matter of public policy.

In the location and construction of a railroad there is almost always a choice between two courses. Its projectors may make a small original investment, and be subject to high operating expenses; or they may make a large original investment, for the sake of lower operating expenses. In the latter case they risk much more than in the former; but they also have more to gain in case the traffic proves large. The Commissioners propose to deprive them of a part, if not the whole, of this gain. If this practice is systema tically pursued, it will make railroad investors try to build Mississippi railroads as cheaply and poorly as possible. The Commission virtually says: "You shall not receive any considerable return for your foresight in making a road which can handle a large traffic with profit. You have taken the risk; we shall take the profit."

Of course, in any system of rates some roads will have to make higher charges than others. There are places where a road, to be built at all, must be built cheaply, and must depend for its support upon a small traffic done at high rates. But it seems false policy to encourage the building of such lines where better ones are possible. This is precisely what the Mississippi Commission does when it makes a difference between two parallel lines such as to prevent the better one from reaping the advantage of its superior efficiency.

Nor does the evil end here. Differences in rates, when made on this ground, take away the motive for economy in operation as well as for foresight in construction. If a large traffic, well and properly handled, is a mere ground for reduction in rates, there is no motive for securing it. It was perhaps the chief disadvantage of slave labor that the slave had no motive for increasing his efficiency, knowing as he did that he could receive little or no share of the surplus profit. There is danger that similar treatment will have the same disadvantageous effects upon the service done by the railroads for the community.

We have thus far considered the question as affecting Mississippi alone. But the inter-state relations involved are of no less importance. Whatever be the facts in the present case, there can be no doubt that the existence of a large and remunerative traffic in other states makes a railroad more helpless against adverse legislation. A dozen years ago, when railroad systems were less consolidated than they are to-day, adverse legislation in a single state could so reduce the resources of a railroad as to destroy its efficiency and cause the community which depended upon it for transportation to feel their mistake. The Potter law in Wisconsin worked its own cure in this way in the space of two years. To-day the roads have no such protection. A forced reduction in rates in Mississippi may be, for the time being, paid for by shippers in other states. The evil results are in the long run not less real, but they are less obvious. There may be in fact a positive temptation to the commissions of each state to give their own locality the benefit of this process. "Get ahead of others, or others will get ahead of you," is a most potent appeal in cases of this kind. The trouble is, that whoever gets ahead in such a race, the railroads must always fall behind.

This constitutes precisely one of those things which it is the duty of the Supreme Court to prevent. It is an inter-state conflict which must do harm. If it be true, as alleged by the authorities of the Illinois Central, that the Mississippi Commission is forcing them to pay for handling Mississippi traffic by resources which can only be obtained elsewhere, it becomes a clear case for Federal interference. We trust that they will bring the matter to the test of a distinct and final judicial ruling. If the principles involved are brought clearly before the United States Supreme Court, we do not see how there can be any doubt as to the result.

Report of the Illinois Commissioners.

The Illinois Railroad and Warehouse Commissioners report for 1886-7 is more than a year old, and even now, for lack of funds, can hardly be said to have been published.

From the abstract at hand it would appear that only eleven roads out of fifty-eight paid dividends on their stock.

The record of accidents, excluding that at Chatsworth, in which 83 were killed and 151 injured, is as follows:

	Killed.	Injured.	Total
Passengers	14	52	66
Employés	132	642	774
Others	290	263	553
Total	436	957	1,393

Two hundred and ninety-seven employés were injured in coupling and uncoupling cars.

The report deals at some length with the adverse effects of the Inter-state Commerce law upon points in Illinois which had previously enjoyed special advantages. Their distributing trade was taken away from them by points a little further east. The merchants of these places demanded a readjustment of through and local rates which should prevent this result. A conference committee of merchants, shippers, manufacturers and representatives of the railroad companies was appointed to

settle these grievances, but could only adjust a few of the many points at issue. The Board of Commissioners attempted to carry matters still farther in the same direction. The changes which they have introduced are much less radical than those which have been made in some other states. In fact the whole tone in which this aspect of the subject is treated is moderate and sensible. The Commissioners show the dangers to the public itself from sweeping reductions of rates. They say that good, safe and comfortable coaches; good, sound and safe road-beds, bridges and culverts; skillful, careful and faithful engineers, and careful conductors, brakemen and trackmen are of as much importance as low freights or low passenger fares. These all cost money and must be provided for out of the earnings of the railroads before dividends can be paid to the owners, and before sweeping reductions of maximum rates can be reasonably demanded. The reports of the Illinois railroads show that with most of them a reduction of maximum rates would prevent further immediate repairs and betterments of the railroad tracks and equipments, and would require reduction of expenses in many directions, among which would be the wages of the vast number of persons now employed by the railroad corporations, only a few of which corporations are now making more than running expenses, taxes and interest. A reduction of wages would probably result in their employing cheaper men, and consequently less skillful and efficient service would be rendered, which would result injuriously to the public no less than to the owners of the railroad property.

In conclusion, the Commissioners say that during the year the tendency in freight rates has been downward; much lower through rates and to some extent lower local rates have been reached on most of the lines of railroads in Illinois, and the patrons of the railroads are generally less disposed to complain of the treatment they receive from the managers of the railroads than during any former year since the Railroad and Warehouse Commission was created.

The Society of Arts' Canal Conference.

There has been for a long time, as the readers of the *Railroad Gazette* are aware, dissatisfaction among the manufacturers, miners and other producers of Great Britain at the high rates charged for transportation in that country. The railroads have opposed, successfully so far, any legislation tending to reduce or even control their charges, and as they own or control links in all, or nearly all, of the important canal routes of the kingdom, the public is without the advantage of competition from canals. In the meantime the manufacturers hold that a great deal of the present industrial depression and want among the operatives is directly due to high rates of transportation, and turn to larger canals as the readiest solution of the difficulty.

At the request of various important bodies the Society of Arts lately held a "canal conference," with Sir Douglas Galton in the chair. Fifteen papers by eminent engineers and business men were presented to the conference, covering, with more or less fullness, canal engineering; the history, rise, progress and present condition of canal and inland navigation in Great Britain; the mutual influences of canals and railroads on each other, and a comparison of the costs of conducting traffic on each, and an abstract of and reference to the laws governing canals and canal traffic.

Sir Douglas Galton said that out of a total of about 4,000 miles of inland navigation in Great Britain, 1,445 miles are owned by canal companies, 927 miles by public trusts, and about 1,333 miles are controlled by railroads, while 188 miles are out of use. He further said that the gauge of canals is not uniform, the locks varying from 212 by 22 ft. to 70 by 7 ft., and that the whole experience of inland navigation in Europe, in America, and in this country, shows that if the transit by canals is to be cheap, the canals and the locks must be of adequate size, for whilst with small boats competition with a railroad is impossible, large boats, on the other hand, would enable goods to be conveyed by canal at a figure which railroads would find it difficult to underbid. The cost of carriage is so important an element in the cost of production and in profit that the question may very usefully be raised as to how our waterways can be best regulated so as to afford the relief so much required by the national industries under the new condition of competition to which they are exposed from the increased production of foreign countries.

The canal history of England may be said to date from the work on national economy by Andrew Yarronton, in 1677, who pointed out the advantages the Dutch received from their system of navigation, although the first act for the improvement of rivers dates from 1423, and rivers had been improved, and canals constructed, so that "in 1760 the advantages with regard to water carriage enjoyed by England enabled her to outstrip other countries in the development of her manufactures." But it was the "Duke of Bridgewater's Act," in 1759, in connection with Brindley's grand project of uniting London, Liverpool, Bristol and Hull, the four great ports of England, that brought on the canal furore of 1790, and led to the completion by 1800 of 2,383 miles of canal out of 2,919 miles now existing. In fact canal construction virtually ceased in 1830, when about £14,000,000 had been expended. This must have given England at the commencement of this century about one mile of canal or navigable river for every 17 or 18 miles of her area; whereas France at the present time has only about one mile of navigable waterway to every 26 square miles, but the minimum size of locks on French canals and rivers is 126⅓ × 17 × 6½ ft.

Of course, this very extensive system of waterways gave England great facilities for distribution, both absolutely and relatively. As Macadam had not at that time introduced his system of repairing roads, the carriage of goods, when not done by coasters, "was by pack horses, as the roads were only fit for wagons during a few months of the year," and when the Duke of Bridgewater built his canal, the cost of carriage of coal from Worsley to Manchester, 10½ miles, which had by pack horses been 6 to 8 shillings per ton, was reduced to 2s. 6d. "The real commercial prosperity of England dates from this period of canal development and enterprise."

The benefits resulting from canal transportation must have been fairly shared by the owners of the canals. Mr. Cottsworth gives the names of seven canals that about 1833 were dividing from 80 to 25 per cent., the £100 shares standing from 1,280 to 545. In fact, their desire to engross too large a share of these advantages was a decided assistance to the railroads in their efforts for charters, as the colliery proprietors of Derbyshire and Nottingham were paying 6s. 8d. per ton (exclusive of boating and haulage charges), for 34 miles, or 2½d. per ton per mile, and desired a reduction in view of opposition for other localities. The canals (there were three separate companies in this distance) offered a drawback of 1s. 6d. on such coal only as was delivered at 10s. per ton; the coal owners wanted 3s., and in default built a railroad. The canal tolls are now 6d. for the whole distance. Under the rapid development of railroads the canal charges were gradually reduced, until in 1842 the average canal dividend was only 7 per cent. But tolls are not, in all instances, very low in England at present, as a manufacturer mentioned at the conference that on a canal, "one of the most inconvenient canals which could possibly be designed," about 6 miles long, he was paying a toll of 5d. per ton at the present time in preference to paying railroad rates.

After the commencement of the "railway mania" and the purchase of portions of the trunk lines of canals by the roads the position of the canals gradually became weaker; but, according to Mr. Cottsworth, "It is cheering to note that those canals which have kept abreast of the times by improvements in carrying capacity and management, have more than held their own against railways, as instanced in the Aire & Calder Navigation, the Leeds & Liverpool Canal, paying 23½ per cent., the Bridgewater Navigation, and others. From this we may gather that canals are beaten where the old systems of working still exist, but that when improved to meet the requirements of the present trade and well managed, they will again become both useful to the community and remunerative to the proprietors."

But the supremacy of the railroads has not brought about a state of things entirely satisfactory, and in the conference Mr. F. C. Condor, M. I. C. E., devoted a paper to the theory, which is widely held in England, that while the canals were ruined by the abstraction of their natural traffic, "the theft was twice cursed; it ruined those who took as well as those who lost." From 1854, the first year for which the returns are available, to 1885, one-fifth was added to the cost of each mile of railroad in the United Kingdom. In 1844 and 1845 the net profit on the capital was 10 per cent.; in 1885, when 22 per cent. of the revenue was derived from a very low-rated mineral traffic, the return was a little over 4 per cent. on the capital. This addition to the capital of English roads is laid by Mr. Condor to the mineral traffic, and he quotes the report of a commission saying that "coal cannot be carried on railways, even for long distances, at a less cost than from 0.54d. to 0.62d. per ton per mile, but can be transported by canal for 0.22d."

There seemed to be a feeling that government would not buy the canals and make them free, as it would sacrifice the vested interests of 500,000 shareholders who had invested their money on the faith of government granting a monopoly; and Mr. Lester asked indignantly if "the interests of 34,000,000 of people are to be sacrificed to a body that has boycotted trade so long." It was repeatedly said in substance, if not in words, that "agriculture and commerce are suffering most grievously, and that as a nation instead of the cheapest we have the most costly transport in the world."

The returns of the British Board of Trade give the following quantities and values for the trade of first six months of 1887 and 1888:

	Quantities. 1887. Tons.	Quantities. 1888. Tons.	Values. 1887. £	Values. 1888. £	Inc. per cent.
Total value of imports	.....	.... ..	178,867,159	189,729,707	6.0
Total value of exports	.....	....	104,295,890	112,677,945	8.0
Total exports of iron and steel	1,983,311	1,946,801	11,977,253	13,085,483	9.2
Total imports of iron and steel	82,790	71,092	620,812	513,687	Dec. 17.4

Girders and beams, however, have increased 12.3 per cent. in quantity, but only 1.9 per cent. in value. The adverse balance of trade was, for first half of 1888, £77,051,762, against £74,571,269 for the same period in 1887.

As there was no appreciable decrease of exports in any class during the half year, the English papers regard the outlook as encouraging, particularly as the increase of quantity is in the higher priced articles. The *Iron and Steel Trades Journal* gives the following table showing this for the iron trade:

	1885. Tons.	1886. Tons.	1887. Tons.	1888. Tons.
Pig iron	450,739	497,006	559,308	501,753
Railroad iron and ste'l	363,125	345,826	445,087	521,100
Manufactured	697,198	765,423	978,916	923,968
Total	1,511,062	1,590,255	1,983,311	1,946,801

England has increased her exports to all countries except Turkey, Italy, Russia, British North America and the United States, and for this country the decrease has been from 688,261 tons for 1887 to 327,676 tons in 1888, or a decrease of about one-half. The August increase was in the shipments to the Argentine Republic from 60,712 to 165,149 tons.

The principal items taken by this country for the two half years are given below:

	1887. Tons.	1888. Tons.
Pig iron	217,406	80,218
Bar, angle, bolt and rod iron	1,509	2,969
Railroad iron	65,175	37,131
Hoops, sheets, etc.	13,629	15,535
Old iron	121,802	11,475
Unwrought steel	130,106	36,299
Steel rails	64,132	35,636
Tin plates	135,316	140,424
	1887. Values.	**1888. Values.**
Tin plates	£1,790,483	£2,039,018
Steam engines and parts	23,592	16,850
Other machinery	251,861	272,247
Hardware and cutlery	172,287	176,464

"Change of Time Next Sunday" is the heading of a cardboard sign which the Lake Shore and some other roads hang near their ticket windows when occasion requires. The peculiarity of this placard is that it is so worded as to serve equally well for any change, and so can be used a number of times, or as long as it remains clean. And this point—cleanliness—suggests the chief objection to it; for a card invariably looks shabby after being used a few times, like the bill of fare at a second-class hotel, and a neat wall or frame is disfigured by it. If the expense of printing special "flyers" to announce every change is deemed unwarrantable it is a pertinent question whether a dark colored card or a metal sign of some kind would not answer the purpose.

The whole subject of time-table posters still lacks proper attention on many roads. The slipshod plan of leaving the public to find out from the news columns of the daily papers a few hours before the change takes effect, or even sometimes a few hours after, is still in vogue on roads otherwise rated as enterprising. Changes in time, although they cost enough to make a respectable purse of pin-money for a director's wife, seem to be made for as slight reasons as they ever were by the most careless superintendent. But even if it be necessary to make a new table in a hurry a notice can at least be given and always should be. It should appear at every ticket window, even if the posted table is on the opposite wall, for many passengers use pocket tables and never look at the poster. It should be placed over or near every posted table, and for this purpose a list should be kept of all places that have been furnished with posters. The notice should be shown in all cars frequented by commuters, for many of these passengers do not regularly visit the waiting-rooms; and if the permanent form, like the Lake Shore's, is used, it is necessary to carefully instruct all concerned to take down the cards promptly on Saturday at midnight. If a few of our enterprising lines would take concerted action and lead off, there would seem to be no great reason why the European practice of always changing at or near a given date could not be brought into use here.

The announcement of summer trains, with the dates that they are put on and taken off, is now found feasible a month in advance. Why not make all changes on the first Sunday in the month, or of certain months?

The following are the shipments of ore from Lake Superior districts up to the middle of July for the years 1888 and 1887. The figures are from the *Iron Trade Review:*

District.	1888.	1887.
Marquette	510,951	659,609
Menominee	347,536	420,686
Gogebic	393,814	337,638
Vermillion	98,086	108,562
Totals	1,350,387	1,526,486

This shows a decline on the shipments of 1887 of only 11½ per cent, a decline, considering the late opening of the lakes, and the disturbed state of the iron market, that is of less magnitude than might be expected. Both lake freights and wages have been reduced, and probably the profits of the miners and shippers. Last year about $16,000,000 was paid to miners and transportation companies for mining and forwarding Lake Superior ore, but it does not appear probable that so large a sum will be distributed there this year.

The scheme for building steel ore carriers at Sandusky, which we noted some time since, is meeting with decided opposition from vessel owners, and from those interested in the existing ports, and an "open letter" has lately appeared warning English investors against throwing money away on a visionary scheme.

The Ontario & Western has withdrawn from the Emigrant pool because the Lackawanna is paying commissions, which is very naughty of the Lackawanna; and, as to the source from which the objection comes—well, George Sand says there is no such prude as the woman whose past history contains a secret.

But, speaking seriously, the case illustrates well the evils under which our railroads are suffering. There is an immigrant pool because this is a line of business where some sort of common action is found to be a necessity. It exists only on suffrance, because the law prohibits such arrangements. Deprived of every guarantee of permanence, it "makes hay while the sun shines" and imposes what are in all probability unduly high rates. These high rates increase the temptations to evade the pooling contract. One road begins paying

commissions; its example is followed by others, until finally some competitor believes that the temporary gain to itself from leading the break which seems bound to come will more than offset its share of the general loss. This is the condition of affairs to-day.

A decision of the Supreme Court of Missouri, of which an account is given in another column, shows how slowly any real knowledge of the workings of railroad business makes its way in men's minds. The Court held that while certain allowances for quantity were unlawful, as giving an exclusive privilege or monopoly, nevertheless, "a common carrier has the right to contract to ship freight at a lower rate than the published tariff rate, if he choose to do so, and such a contract is not against public policy, unless the privelege to ship at such rate is granted exclusively to the shipper with whom it is made or is denied to other shippers." There is a fallacy in this reasoning. The failure to publish the rate has a tendency to make it exclusive. In fact, the chief motive for an unpublished rebate is to create a difference in treatment. If not in itself constituting unjust discrimination, it furnishes strong *prima facie* evidence of such injustice. It may not be assault and battery for a man to hide in the bushes at night with a club in his hand; but it would be a most unwise course which should therefore say that a man was at perfect liberty to assume such an attitude without interference from the police. If the most plausible motive for an action is an illegal one, and if it proves that in nine cases out of ten it results in more or less unlawful conduct, it will not do for the courts to pronounce the action itself an innocent one. It is true that the law does not condemns a man for his intentions, but it does condemn an action for its tendencies.

A novel action against a railroad has just been decided in North Carolina (Allen v. Cape Fear & Yadkin Valley R'y Co.). A merchant in that state sued the railroad company for libel for issuing the following order to its agents: "You are instructed to ship no lumber or merchandise of any description to Mr. J. L. Allen except when all freight and charges are paid," and for requesting a connecting road to make a like order. The railroad admitted issuing the order, but justified it on the ground of his repeated refusals and delays in paying freight bills when presented, and the inconvenience it was put to in collecting them. The Supreme Court held that the order was a privileged communication and not actionable without proof of malice, which was not shown. And in the second place the court decided that the company had a legal right to issue orders of this character. "The order," said the Court, "assuming it to have been issued in the interest of the company, real or supposed, to withdraw from the plaintiff a privilege which hitherto he had enjoyed in common with other patrons of the road, is but the exercise of a right to demand of every one that upon all freight conveyed the charges must be paid in advance; and we do not perceive any legal wrong done to one to whom credit may not be given, because it is given to others, it may be, because of their punctuality in paying bills whenever they are presented. The statute recognized the right, for it compels the company to furnish transportation, not generally, but 'on the due payment of the freight or fare legally authorized therefor,' and therefore the exaction of prepayment of freight for goods consigned to the plaintiff is but the assertion of a right which might be, if in fact it be not, enforced against all dealers."

We owe an apology to our esteemed contemporary, the *Northwestern Railroader*. In a recent issue that lively journal says:

"Without seeming to be obtrusive we cannot resist again calling the attention of our contemporaries to the fact that in their alleged 'full and complete' accounts of the recent conventions no mention has yet been made by any one of them of a very interesting part of the official proceedings—viz., the passing of a vote of thanks to the *Northwestern Railroader* for some alleged enterprise which it showed in publishing certain daily editions."

If we never mentioned that vote of thanks it was through inadvertance, and not from any desire to suppress the fact. We congratulate the northwestern journal on the glory it won by the issue of its daily edition and feel sure that it will reap that higher reward of a good journalist, a long subscription list and more "advs."

A local storm of great severity visited West Virginia and Southwestern Pennsylvania and Southeastern Ohio again July 19. The Baltimore & Ohio and Pittsburgh, Cincinnati & St. Louis suffered from washouts and land slides, and several small bridges were carried away. The damage to the Pittsburgh Division of the former road is said to be great, while the latter road did not run regular trains out of Wheeling for four days. The county engineer of Ohio County, West Va., reports that not a road in the county is left in condition for travel and scarcely a bridge uninjured.

The Chicago *Tribune* from time to time calls attention to the loss of life constantly taking place at the railroad crossings of streets in Chicago. In a late issue it says that between Jan. 2 and July 16 the city coroners have held inquests on 126 bodies of people killed at crossings. That is, one in six of all the inquests held have been on victims of highway crossing accidents. Energetic measures are being taken to cause gates to be placed at crossings, but obviously uninterrupted traffic and perfect safety can only be secured by viaducts.

Locomotive Performance, Philadelphia & Reading.

The following table shows the locomotive performance on the three divisions of the Philadelphia & Reading for the month of May, 1888:

	G. & N. B. R. and N. P. & B. B. Division.	Main Line Division.	Mahanoy Division.	Total.
Miles run in passenger service	174,772	107,228	37,786	351,657
" " freight "	56,169	108,329	82,967	265,899
" " coal "	37,828	179,245	128,352	346,139
" " shifting "	95,395	223,208	46,623	371,694
" " roadway or construction service	8,084	10,996	3,672	24,569
" " shipping department service (wharf engines)	.....	11,098	.....	11,098
Total	372,248	640,104	299 400	1,381,056
Cost of fuel (coal and wood)	$21,003 55	$28,565.76	$12,957.70	$66,553.24
" oil and waste	1,655.31	2 684.84	1,090.06	5,651.53
" engineers and firemen	20,144.16	40,000.35	14,335.57	83,342.11
" engine watchmen and wipers	1,813.84	3,186.76	1,066 26	6,605 22
" repairs (material and labor)	17,834.06	29,845.43	10,423.17	67,866.87
Total	$62,453.92	$104,283.14	$50,873.46	$230,018.97
Cost per mile run for fuel	Cents. 5.64	Cents. 4.46	Cents. 4.33	Cents. 4.82
" " " " oil and waste (includes oils of all kinds)	.44	.42	.36	.41
" " " " engineers and firemen	5.41	6.25	6.46	6.03
" " " " engine watchmen and wipers	.49	.50	.36	.48
" " " " repairs (material and labor)	4.79	4.66	5.49	4 91
Total cost per mile run	16.77	16.29	17.00	16.65
No. of miles run to ton of coal	24.94	25.53	25.19	25.68
" " " pint of oil (does not include illuminating oils)	7.21	7 86	9.18	7.99
" " " lb. of waste	75.66	76.38	102.25	81.65

NEW PUBLICATIONS.

The Civil Engineer's Pocket Book, etc., by John C. Trautwine, C. E. Thirteenth edition. Thirty-second thousand. Revised by John C. Trautwine, Jr., C. E. John Wiley & Sons: New York. Price, $5.

In announcing this new edition of a work now universally well known we cannot do better than reprint the preface to the 32d thousand:

"The principal changes made in preparing for this edition are those in the articles on mechanics and on strength of materials. The introductory remarks on both subjects, the rules for parallel forces and centre of gravity, and the remarks on deflections of beams have been re-written and greatly extended, and lists of rolled steel I beams and of separators for beams have been added. A number of the rules under mensuration have been put into better shape. Several additions have been made to the articles on turnouts, and prices, etc., have been revised to date. A number of less important changes will also be noticed."

Business Chart Showing the Course of Business in the United States for Thirty Years. Roderick H. Smith, Kemble Building, New York.

This is a colored lithograph, showing by diagrams the course of prices of certain articles and giving other information for the years 1854 to 1887, inclusive. The subjects covered are eight in number, viz.: price of pig-iron, failures among traders, the number of immigrants, price of railroad stocks, clearings of the New York banks, miles of railroad built, exports and imports and shares of stock sold. The chart is on so large a scale that the lines may be readily followed, and the information is presented in a way convenient for comparison.

Mr. Forney's article on locomotives and cars appears in the August number of *Scribner's Magazine*, and as might be expected, is an excellent epitome of the subject for general readers. The illustrations are interesting, and for the most part novel, and it is needless to say that they are well executed. The illustrations of erecting shops will be novel to many, for even among railroad men few have been inside an erecting shop and seen locomotives in the process of manufacture.

Recent Tests of Structural Steel.

We have received from Messrs. Carnegie, Phipps & Co., Limited, a pamphlet containing the record of tests of Bessemer and open-hearth steel, made in April and May, 1888. The steel was in various forms, and was furnished to boiler makers, bridge builders, ship builders and general manufacturers, in accordance with definite specifications. It is stated that of all the samples tested only three were rejected, which speaks very well for the quality of the steel.

Much has been written in regard to the difficulty of obtaining uniform grades of steel, especially for the construction of boilers, and a summary of these tests, which include samples of steel furnished to prominent railroad companies and boiler makers, will show the possibilities of modern practice; since it may fairly be assumed that the results given in this pamphlet represent fairly the average product turned out by Messrs. Carnegie, Phipps & Co. The tables give the extreme range observed in each set of tests, and will be found useful as guides in drawing up specifications on account of the varied character of the requirements. The results given in the columns headed "*per cent.* of elongation" were obtained, usually, by measuring the elongation of a test piece 8 in. long; but in a few of the experiments the lengths of the test-pieces were 2 and 4 in. respectively.

Summary of Open-hearth Steel Tests.

Number of tests.	Kind of steel.	Ultimate tensile strength, lbs. per sq. in. Max.	Ultimate tensile strength, lbs. per sq. in. Min.	Per cent. of elongation. Max.	Per cent. of elongation. Min.
64	Ship plate	62,305	60,330	29.22	25.31
20	Boiler shell	60,782	60,098	25.06	23.28
20	Boiler flange	54,983	51,215	32	28.87
11	Fire-box	58,130	52,130	38.5	27.5
1	Fire-box	57,950	.....	41	.....
25	Fire-box	59,910	51,380	34.75	26
14	Fire-box	62,790	50,350	36	29.75
10	Fire-box (best)	57,010	51,320	36	27
4	Ship flange	68,000	63,120	27	25
7	Ship flange	69,210	63,470	30	25.75
4	Boiler flange	55,630	50,920	32.25	29
6	Boiler flange	63,360	55,810	30.62	25
19	Tank	65,940	59,440	27.5	19.25
6	Tank	68,510	63,240	35	25.5
10	Tank	63,210	56,630	23	21.5
20	Bridge	65,940	63,700	29	23
26	Bridge	67,000	59,570	31.5	22.75
4	Bridge	59,900	57,810	33.5	28 12
10	Bridge	69,620	60,360	30	17.5

TECHNICAL.

Iron and Steel.

The Pacific Iron Works, at Bridgeport, Conn., have contracted with the New York, New Haven & Hartford for furnishing about 2,000 ft. of piping, to be used for the track tanks now being built.

Messrs. Binsse & Hauschild, of East Newark, have received the contract for one-half of the gun lathes for the manufacture of the hoops of the 16-inch steel breech-loading rifle guns for the ships now building.

The fifth furnace of the Crane Iron Works, of Catasauqua, Pa., was lighted recently after being repaired. The five furnaces of the company are now in operation.

Work has been resumed at the rolling mill of P. L. Kimberly & Co., at Sharon, Pa., which has been idle for about four months.

It is stated that the Berlin Iron & Lead Works, of Pittsburgh, Pa., contemplate removing their works to McKeesport.

About 1,700 tons of rails were last week shipped to the Mobile & Ohio by the Edgar Thompson Steel Works.

The Betts Machine Co. is just completing a heavy lathe for the Midvale Steel Co., to be used for turning very heavy shafts, and forgings of steel and rolls. The company is also building a number of other heavy lathes.

The Union Rolling Mill Co., of Cleveland, O., has con-

SUMMARY OF BESSEMER STEEL TESTS.

Number of tests.	Kind of steel.	Form of test piece.	Elastic limit. Lbs. per sq. in. Max.	Elastic limit. Lbs. per sq. in. Min.	Ultimate tensile strength. Lbs. per sq. in. Max.	Ultimate tensile strength. Lbs. per sq. in. Min.	Per cent. of elongation. Max.	Per cent. of elongation. Min.	Per cent. of reduction in cross-section. Max.	Per cent. of reduction in cross-section. Min.
6	Slabs	3 in. round	43,130	41,430	66,490	60,760	30.62	25.62	61.48	55.3
10	Slabs		45,250	41,410	70,970	64,240	29.	21.5	62 88	48.74
100	Bars, angles, billets and slabs		46,570	39,290	71,300	61,450	31.75	25.	67.5	42.43
170	Bars and angles		47,690	40,540	73,540	65,200	30.5	23.15	63.74	44.51
121	Blooms, billets and slabs		42,899	38,010	68,700	61,120	31.87	26.	65.2	45 36
14	Billets		41,520	38,330	63,440	59,600	31.25	27.5	67.8	49.3
19	Slabs and blooms		41,570	38,630	65,940	62,980	31.75	25.25	63.59	49.12
11	Blooms and billets		41,410	36,510	65,300	62,020	31.	25.	60.	49.
4	Blooms		42,200	39,110	60,960	58,040	32.5	29.12	66.88	62.66
24	Bars and angles		42,340	39,200	67,080	61,480	31.87	25.25	63.85	54.36
72	Angles, 6 by 6		41,890	31,610	61,540	55,480	35.5	26.25	64.4	47.1
17	Beams		43 030	38,630	69,400	61,403	30.5	18.	57.6	44.1
29	Bars and angles	Full size.	45,780	35,100	76,000	60,480	29.25	21.25	56.93	37.42
36	Bars, angles and beams		47,750	36,150	70,970	59,740	31.25	23.25	62.25	45.08
33	Bars and angles		45,370	33,580	76,460	61,500	29.75	23.12	59.58	37.39
56	Bars, angles, blooms and slabs		44,470	34,700	70,100	61,460	33.37	24.25	54.91	36.34
19	Angles, 4 by 3 and 3 by 2½		40,850	35,800	63,720	60,330	31.5	27.5	53.3	46.2
17	Bridge plates		40,590	36,910	67,460	60,070	28.75	25.	56.08	44.01

tracted with Lean & Blair, engineers and contractors, for the erection of five large heating furnaces and a gas-producing plant complete.

The Benjamin Machine Co., of Chicago, Ill., has been incorporated, with a capital stock of $50,000, to manufacture wood working and other kinds of machinery. The incorporators are R. B. Sample, H. M. Graham and R. W. Morrison.

Negotiations are said to be pending looking toward the erection of steel works in Fall River, Mass., by a syndicate of capitalists, who propose to invest $1,000,000 in the purchase of a site and the erection of a plant. The works will give employment to 800 hands when in full operation.

The rolling mills of the Oxford Iron Co. resumed operations this week. They have been closed for several weeks.

Bids were opened this week by the Navy Department for steel for use in construction of the armored battle-ship "Texas," to be built at Norfolk. There were five bidders, the lowest being as follows: For 920 tons of steel plates, Parke Brothers & Co., of Pittsburgh, $73,983; for 503 tons steel shapes, Carnegie, Phipps & Co., of Pittsburgh, $43,266; 100 tons of steel rivets, Carnegie, Phipps & Co., $8,602; 120,000 tons of steel castings, no bidders.

Car Notes.

The Richmond & Danville is reported to have contracted with the South Baltimore Car Works to build 500 cars. The Wagner car door has been adopted for the order.

The East Tennessee, Virginia & Georgia has awarded the contract for building 300 flat and coal cars to the Southern Car Works, of Knoxville, Tenn.

The Rome & Decatur received this week 30 gondola and box cars from the Anniston, Ala., works of the United States Rolling Stock Co. Three locomotives have also been received from the New York Locomotive Works, of Rome, N. Y.

It is stated that the Atchison, Topeka & Santa Fe has cancelled the order with the Indianapolis Car & Manufacturing Co. for 2,000 gondola cars and in place has ordered 200 furniture cars.

The Elliott Car-Works at Gadsden has recently completed a number of new ore cars for the New Orleans and Northwestern division of the Cincinnati, New Orleans & Texas Pacific system.

The United States Rolling Stock Co. of Anniston, has just completed 14 freight cars for the Rome & Dalton. Fifteen gondola cars have also been shipped to the Anniston & Cincinnati, and 12 charcoal cars to the Georgia Pacific.

Manufacturing and Business.

Mr. Henry H. Mansfield, who for many years was connected with the firm of Barrows & Co., has been engaged by Messrs. T. Williams, Harris & Co., engineers and contractors, af New York, to manage their equipment and supply department.

The Ensign Manufacturing Co., of Huntington, W. Va., has received a contract from the Baltimore & Ohio for 2,500 car wheels per month for the road.

The New York Central & Hudson River is placing blue and white enamel signs, 6 ft. long and bearing the name of the station, on stations along its road. The signs are placed at each end of the station on posts.

The Louisville Water Co., of Louisville, Ky., has purchased two Ingersoll Straight Line air compressors.

It is reported that the Westmoreland Coal Co., of Irwin, Pa., intends building a new car shop at Irwin, to employ about 100 men. The firm will build its own cars, which are now made in the East.

Mr. J. D. Thomas, representing the Westinghouse Machine Co., of Pittsburgh, has departed for Rome, Italy, to introduce the Westinghouse system of electric lighting into that country.

The Rail Market.

Steel Rails.—There is no business reported, but quotations remain nominally $30 at Eastern mill for moderate lots.

Old Rails.—Quotations continue in the East at $30 for small lots.

Track Fastenings.—Quotations: spikes, 2@2.05c. delivered; angle bars, 1.85@1.9c. delivered.

Magnetism in Watches.

In the issue of June 30 of *The Electrical World* there appears an article on "Magnetism in Watches," by C. K. Giles. Mr. Giles demonstrates that a balance wheel, as generally made, *i. e.*, a steel and brass compensated balance, is virtually a compass needle. I have tested a number of such balances, and find that in the majority of cases such is the fact. Of course the traces of magnetism in a carefully made balance are very slight, so that it becomes difficult to determine to what extent this cause alone will affect a watch exposed to no other magnetic influence except what the earth has on the compass needle, or, in this case, the balance wheel of the watch. But I believe it is safe to assume that the effect will be directly proportional to the strength of the magnetism in the balance wheel. Then let us replace the balance wheel with a bar of steel strongly magnetized. Now let us put the watch in a shield case and let it run, say 24 hours, in a certain position and note its rate. Then let us change its position, and let it run another 24 hours. Now if the "rate" will be the same with the watch placed in a different position, it follows that the shield is an absolute protection against magnetic influence. If, on the contrary, the "rate" varies with the different positions of the watch, as you will find it does, then the shield is not efficient, or, at least, is only a partial protection.

Another test less troublesome to make is this: Take a shield case and place a compass instead of a watch within it, and move a magnet around the shield and you will see the needle respond to the motion of the magnet.

I have experimented considerably with the shield case, and every experiment has led to the conclusion that no watch whose escapement, balance wheel or hairspring is made of magnetic metal can be depended on when exposed in the pockets of persons having business around powerful continuous current dynamos.

What degree of perfection has been attained in watches made of non-magnetic metal I am not prepared to state at present.—*Oscar Ericsson in the Electrical World.*

The New Tower Bridge in London.

Standing in the Thames, nearly opposite the Tower of London, are to be seen two enormous timber stagings rising several feet above high-water level. These stagings indicate the positions of the two piers which will eventually carry the towers of the new Tower Bridge which is now being constructed there. This is to be a bascule bridge—that is, the drawers, instead of revolving around a vertical axis, will revolve on a horizontal axis, and will open upward. There will thus be no interference with the crowded traffic of the pool which there would be in the case of a bridge turning on a vertical pivot. The bridge will have three spans, the two side spans being fixed and the central span having traffic ways at two different levels, the upper one being a fixed bridge for the use of foot passengers when the lower bridge is open for the passage of vessels. The headway of the lower bridge will be 29 ft. 6 in., and that of the upper bridge 135 ft. above Trinity high water, which is more than ample for the masts of ships frequenting the Thames. The headway of the side spans will vary from 20 to 27 ft. above Trinity high water. The central span will have a width of 200 ft., and the two side spans 270 ft. each. Each of the two piers of the Tower Bridge, which are now gradually rising in the stream, will be 70 ft. wide. They are being constructed hollow, with chambers to receive the counter-balanced ends of the opening leaves of the central span. The foundations of the piers are constructed by sinking wrought-iron caissons about 30 ft. square 20 ft. into the bed of the river. These caissons are filled with Portland cement concrete to a short distance below the level of the river bed, and above that Cornish granite and brickwork in cement are employed. On each of the piers a lofty tower will be erected, the upper part of which will receive the ends of the suspension chains of the side span, and will also carry the high level footbridge which spans the central opening. When the lower bridge is open for river traffic, foot passengers will ascend to the high level bridge from one side span, and, having crossed, will descend to the other side span, either by means of a staircase or by hydraulic lift, both of which will be provided in each tower. The width of the bridge and its approaches will be 60 ft., diminishing to 50 ft. at the central span. Hydraulic machinery for actuating the lifting portions of the bridge will be supplied by Sir William Armstrong, Mitchell & Co., of Elswick, and the steam engines for driving this machinery will be placed on the southern side of the river. They will consist of 2 engines, each of 360 horse-power, taking steam from 4 boilers. Four of the accumulators will be placed upon the piers and 2 on shore on the south side of the river. The 2 leaves of the bridge will be actuated by rotary hydraulic engines acting through gear on 4 quadrant racks on the rear ends of the leaves. The chains and girders of the bridge will consume about 7,000 tons of iron and steel; each of the leaves of the bridge will weigh about 350 tons, and the superficial area of each leaf will be about 5,000 sq. ft. The hydraulic machinery will be of sufficient strength to control the bridge in a wind exercising the extreme pressure of 56 lbs. per square foot.

New Flint & Pere Marquette Steamer.

The Detroit Dry Dock Company launched on the 14th inst. the fourth steamer built by that firm for the Flint & Pere Marquette. She is specially designed for ice-breaking, and while built of wood, has a strong iron forefoot and is sheathed to above the water line with iron. Her principal dimensions are as follows:

Length of keel	183 ft. 3 in.
Length over all	203 " 0 "
Beam moulded	31 " 0 "
Depth moulded	14 " 0 "
Draft loaded	12 " 6 "
Displacement loaded	1,585 tons.
Triple expansion engines	15, 23 & 37 by 36
Propeller diameter and pitch	.9 ft. 6 in. & 12 ft. 6 in.
Boilers, two	9 ft. by 11 ft.
Boiler pressure	140 lbs. per sq. in.

Launch of the Cruiser Charleston.

The evening of July 19 cruiser No. 5 was launched at the shipyards of the Union Iron Works, San Francisco, and was named Charleston. Following are the principal dimensions of the Charleston: Length over all, 320 ft.; length between perpendiculars, 300 ft.; extreme breadth, 46 ft.; depth, 34 ft.; mean draft, 18½ ft.; displacement, 3,730 tons. She is built of steel and has twin screws. The ship's armament will consist of two 8-in. breech-loading rifles, mounted on pivot carriages, fore and aft, having a train of 230 and an effective range of about eight miles; three 6-in. guns mounted on each side; ten 6-lb. Hotckiss guns, and four Gatlings. The contractors expect to deliver the vessel to the Government next December.

Petroleum Engine.

A petroleum engine is now being exhibited in England, and is attracting a great deal of attention. The petroleum is placed in a tank in the bed of the engine, and is forced through a pipe into an apartment where a blast of air turns it into a fine spray. A small battery in the rear supplies an electric spark and the spray coming in contact with this electric spark furnishes the motive power. This engine is said to be very simply constructed and works with admirable regularity. The piston needs no oiling, the petroleum vapor filling this necessity.

Wood Working Machinery.

The Egan Co., of Cincinnati, have recently introduced an improved double cylinder endless bed surfacer with broken roll so that two boards of different thickness can be fed through the machine at the same time.

Traction Increaser.

A traction increaser is being tested on three Pennsylvania freight engines. A drawbar between the locomotive and tender automatically throws a part of the weight of the tender on the driving wheels of the engine in proportion to the load the latter has to pull. This makes the locomotive heavier when it should be so, and thus increases its adhesion. One of these locomotives recently made two successful trips over the mountains. On one trip 10 per cent. was added to the weight on the driving wheels and 30 per cent. at another time.

Tempering by Electricity.

A process of tempering watch springs by electricity has been in operation for some time at the works of the inventor, Mr. Frederick Sedgewick, Oak Park and Chicago. It is claimed that the tempering process is continuous and that it can be applied to fine wire and other springs, as all oxidation of the heated surface with the air, and the buckling on being plunged into the oil bath are avoided.

In the new method the soft steel is wound, like a long narrow ribbon, on a large spool as it comes from the splitting rolls. The ribbon then passes through a set of very fine but powerful rolls which give it a perfectly even gauge of the desired thickness of the finished spring. The soft steel is again spooled and is ready for the hardening process. From the spool the ribbon passes a point of contact of an electric current from a dynamo, the ribbon itself there forming a circuit by extending to a second point of contact. Midway between the two points, and at the place where the ribbon is raised to a bright red, it passes into and through an oil bath. The second point of contact is in the further end of the bath, so that a greater portion of the current is taken up in the oil. There is a simple device in the bath for preventing the metal from twisting and kinking, and which also effectually eliminates all oil-bubbles which would otherwise form on the surface of the steel and thus make it rough. The ribbon passes through the apparatus continuously at the rate of several yards a minute, and when it emerges from the oil bath it possesses a perfectly uniform temper of great hardness. The fine polished surface given the ribbon by the finishing rolls is not in the least destroyed, and all that is required is to remove the burned oil by the buffing machine and smooth the edges by an automatic grinder. The temper is then drawn to the required degree and color by a current of electricity, and at this point the temper is automatically gauged. It is then ready to be cut into suitable lengths and coiled ready for market.

It is claimed that heavy steel wire can be successfully treated, and that successful experiments have been made with wire for the coil springs which are used in the patent window shade rollers. It is also claimed that mild Bessemer steel wire can be tempered for coil springs such as are used in the magazines of repeating fire-arms. This electric tempered wire can be advantageously employed for light coils of almost any other kind where a reliable spring is required, as it can be "hot set." Mr. Sedgwick has a device for giving the wire its proper temper while in the coil. A spring thus made has much longer life than any other spring coiled in a cold state. Very superior crinoline wire and piano strings can also be thus made. By a slight change in the application of the principles Mr. Sedgwick has successfully case-hardened common soft iron wire. Experiments showed that with Nos. 8 and 9 wire the case-hardening extended through one-third the thickness of the wire, the interior being soft and pliable. This wire would enter very successfully into the manufacture of wire cable and rope of all kinds.

The "Charleston."

The twin screw cruiser "Charleston" was launched from the Union Iron Works, San Francisco, on the 20th. The contract was signed Dec. 28, 1886, and the keel was laid Aug. 27, 1887. The engines and boilers will be placed in position at once, and the vessel will be completed in December. The principal dimensions are as follows:

Length over all	320 ft.
Length between perpendiculars	300 ft.
Beam extreme	46 ft.
Depth	34 ft.
Draft mean	18 ft. 6 in.
Displacement	3,730 tons.
I. H. P., estimated (forced draft)	7,000
Speed, estimated	18 knots.
Weight of engines	710 tons.

She is built entirely of steel and has twin screws. The ship's armament will consist of two 10-in. breech-loading rifles mounted on pivot carriages, fore and aft, having a train of 230 degs. and an effective range of about eight miles; three 6-in. guns mounted on each side; ten 6-lb. Hotchkiss guns, and four Gatlings. She will also carry automobile torpedoes to be launched from tubes above water.

All the modern outfits of complete ventilating and drainage apparatus, electric light plant, and so on, are supplied to the "Charleston." In accordance with the methods of securing some protection, even for unarmored cruisers, she has a curved protective steel deck at and below the water line, extending from stem to stern, and secures partial protection also for the machinery from the arrangement of her coal bunkers. At 10 knots an hour her coal will last for 8,600 miles, and at 8 knots for 11,000. She has no sail power, however, except storm sails, but has two military masts. Her regular coal capacity is 450 tons, but she can carry 800, with an increase then of 1½ ft. in her draft. Her hold is divided into many water-tight compartments by bulkheads, furnishing room for stores, ammunition, chains, and so on. There is no doubt of her being a valuable addition to the navy.

The "Charleston" is modeled after the "Naniwa Kan," a cruiser built for Japan by Sir W. G. Armstrong, Mitchell & Co., of Elswick, England, and engined by R. & W. Hawthorne & Co., of Newcastle-on-Tyne. This vessel was, when completed, the fastest cruiser in the world, having attained 18.75 knots per hour. Complete drawings and specifications were purchased by the Secretary of the Navy and submitted to eminent American firms for comment, which was favorable, representatives of John Roach, Harlan & Hollingsworth, Cramp, etc., stating that the Secretary "could not do better than to have one of the proposed high-speed cruisers engined from these designs as they now stand," and that "the shipbuilding interests of the country will be signally benefited by laying before them the most elaborate results of the best skill and most approved experience abroad."

Burnishing Iron and Steel by Electricity.

The following method for burnishing iron and steel by means of the electric current was communicated by A. de Meritens at a meeting of the International Electric Society in Paris. The layer of oxide on the surface of the metal is obtained by placing the same as anode in a bath of common or distilled water. The sides of the vessel holding the liquid, or a piece of iron, copper or carbon, are used as cathode. The temperature of the water is kept at 160° to 175° Fahr. The electromotive force must be just strong enough to decompose the water, as a current which is too strong gives a dusty layer which is not permanent. Under the action of the oxygen liberating at the anode, a layer of a blackoxide (Fe_3O_4) forms on the metal. This layer can be easily polished, steel giving the best results, while on cast and rod iron a more dusty layer is obtained, though the use of distilled water makes the polish permanent.

Shipbuilding on the Lakes.

A Flint & Pere Marquette boat, No. 4, was launched on July 14 by the Detroit Dry Dock Company. She is a sister ship to No. 3, built last summer, excepting that she has a triple expansion engine instead of a compound. Her length is 203 ft., beam 31 ft., and depth of hold 14 ft. She will carry 900 tons and run 12½ knots per hour. Her route will be between Chicago, Milwaukee, and Ludington.

A Poultry Car.

A car specially designed for the conveyance of live poultry has made a first trip over the Delaware, Lackawanna & Western. The car stands about 2 ft. higher than an ordinary box car, being 13 ft. from the rails. The car contains 116 compartments, each one 4 ft. square, in a series of 8 decks, with an aisle running through it crossways, and another one lengthways. The capacity of the car is from 15,000 to 18,000, or from 3,500 to 4,500 fowls, according to the season of the year. By a system of drop-decks the fowls are loaded and unloaded at the bottom of the car, the sides of which are of strong wire netting, in which are the doors to the several compartments. On the top of the car in the centre is a water-tank large enough to supply a full load on a journey of 2,000 miles. Each compartment is supplied on three sides with abundant food and water by a system of troughs and hose that can be worked while the train is moving. The food is carried in a box or tank beneath the car.

The Nicaragua Canal.

The steamer "Colorado" lately brought to port the following members of the Nicaragua Canal Survey: Messrs. R. E. Peary, W. J. Maxwell, F. P. Davis, P. H. Beirer, C. E. Kern and Diebisch. All of the party are well and report no sickness in the expedition. It is expected that quantities will be worked out and estimates made ready to submit to the company within a few weeks.

Dr. Cardenas, the recently appointed Minister to Great Britain, in a recent interview, said that his government recognizes no concession for the canal, except that granted to the Nicaragua Canal Association in 1887. The "Ameri-

can Atlantic & Pacific Ship Canal Co.," he said, ceased to exist many years ago by virtue of Nicaraguan laws and the time limit in its concession had long since terminated any rights which it held.

A Railroad Tricycle.

A Denver machinist has just made for a surgeon of the Union Pacific a railroad tricycle. The machine has two large wheels to run on one rail, one of them 30 in. and the other 26 in. in diameter, and a 14 in. wheel to run on the opposite rail. It is built with ball bearings, cranks and pedals, like an ordinary tricycle, and the doctor expects to get around at a speed of about 15 miles an hour.

THE SCRAP HEAP.

A Dishonest Conductor.

Conductor Watson Ellsworth, of the New York, New Haven & Hartford, was arrested in the New Haven depot, July 20, for stealing. He has confessed that he sold several hundred dollars worth of tickets which he collected from passengers and failed to punch and turn in at the end of the route. He sold the unpunched tickets to New York scalpers, and was caught in the act by a detective.

Speed of Trains in Mexico.

Somewhat peculiar ideas prevail in Mexico as to the speed of trains. The "Trenes Locales" on the Mexican Central are therefore not obliged to run quite as slowly as "Tren Express con carro Pullman." The former make 21 miles per hour, including stops, while the latter, between the same points, is timed at only 20 miles per hour. The express, however, gains speed on that long portion of the line where it is the only passenger train during the day, and the whole journey from the City of Mexico to Paso del Norte is made at the rate of 26 miles per hour.

Value of Time Saved by Railroads.

As giving some idea of what railways mean in the saving of time and money to passengers, in the case of London alone it is estimated that about 500,000 persons, or about one-tenth of the population of the entire area of the metropolis, require to travel to and from their business every day all the year round. If we remember the distances, it is not too much to assume that the railway will economize for each at least two hours in the week, or, say, five days per annum each. This over 500,000 of people means 2,500,000 days—or an economy of 8,300 years of 300 working days each! Suppose the average earnings of these 500,000 people to be $500 per annum each—not too high an average when we remember the number of millionaires included in the total—we shall see a total money saving—in the sense of time being money—of equal to $4,150,000 per annum.—*London Railway News.*

A Bad Place for Scalpers.

The City of Augusta, Ga., is pretty hard on scalpers. A recent amendment to the city "ordinance to fix annual and specific taxes on business occupations and professions" is as follows: "That there shall be added to said ordinance, as the ninth item thereof, the following:

"'Upon every vender of railroad tickets, whether located in office or store or on the street, except the representatives of terminal roads at Augusta, the sum of Five Hundred Dollars per day.'"

A Novel Street Car Motor.

The Pittsburgh *Gazette* describes a new motor for street cars as a brass tube laid between the tracks, through which plugs or cylinders of iron are forced by pneumatic pressure at intervals of one-half minute or less. Under the car is to be a long bar with a flat piece of iron on the end, on which is an electrical battery strong enough to magnetize the iron sufficiently to form a grip to the moving plug in the brass tube; brass being chosen as it is a good conductor of electricity but is not magnetized. When the car is to be started the battery is set in operation and the magnetized bar draws the car with the iron plug it is nearest to, and on stopping the flow of current from the battery the car stops.

Railroad in Persia.

On the 20th of June last the first line of railway in Persia was opened. It has been constructed by a Belgian company, and extends from Teheran to Shag-Abdul Azima, a distance of about 10 miles.

Those Cruel Monopolies.

A farmer named Smith, living near Cooling on the Alabama Great Southern Railroad, owned two old mules. To keep them from dying on his hands, he tied them on the railroad track, and they came near wrecking a passenger train. Both mules were killed, and the farmer will probably sue the railroad company.

The Austrian Railroad System.

The Austrians claim to have been the first continental European country to establish railroads, commencing in 1828, with a salt carrying line between Ling and Budwees, though it was not till 1838 that the first locomotive ran on an Austrian railroad from Vienna to Wagram. During the first decade 1838-48 the progress was slow, only 669 miles, the government objecting to the building of new lines or the completion of those commenced. At the end of the next decade, 1858, the mileage had increased to 1,483 miles, and in 1868 to 2,746 miles, the Brumer line from Tunsbruck to Bozen having been opened in 1867. During the decade 1868-78, the government, which had given way to private management, undertook the construction of lines, on account of the prevailing distress, and the amount completed at the end of the decade was 6,972 miles, which has grown to 8,719 miles at the commencement of the present year. The most important work of the last decade was cutting the Arlberg tunnel, 6.37 miles long, and opening the Arlberg Railroad, making a new and more direct connection between Austria and Switzerland and France. The control of the Austrian roads is partly in the hands of the state and partly in those of private companies. They give employment, in all departments, to 43,000 persons, or nearly five to the mile.

A Political Club of Railroad Men.

Animated perhaps by the failure of Mr. Depew's effort to get the presidential nomination, or perhaps to while away the hours of idleness consequent upon the strike, certain railroad employés in Chicago have formed a political club. It is said that the purpose is to form similar clubs throughout the state, and devote every effort to electing members of the Legislature who will pledge themselves to vote in the interests of workingmen. A committee was appointed to form branch clubs among the railroad men of the state.

Strike of Union Pacific Switchmen.

Six crews of switchmen on the Union Pacific struck at Denver on the 20th. Two switchmen were discharged, and the company refusing to reinstate them the night crews struck, but the day switchmen are still at work. The company claims that one of the discharged men had been drunk and the other was neglecting his duty. A striker says that one of the switchmen was laid off because he had left his time book at home and was also charged with pushing two Pan-Handle cars off the track. The other was charged with incompetency.

Employes Must Keep their Credit Good.

A press dispatch says that General Superintendent Sweigard, of the Philadelphia & Reading Railroad, has issued the following circular to the employés of the company along the entire line: "All Philadelphia & Reading employés incurring debts and failing to meet them in due time will subject themselves to dismissal. All complaints will be promptly investigated."

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Iowa, a taxpayer, for himself and other voters and taxpayers of a city, asks the Court to compel the relocation of a railroad which had formerly been run through the city, and to aid in the construction of which a tax was voted and paid by the township, on condition that the road should be constructed and operated through the city, but which was afterwards changed so as to run about two miles distant. The Supreme Court decides that it was not sufficient for the plaintiff to show private damage to himself and others by such change, but he must show that the general public, who use the road, has been injured.[1]

In the same state it is held that a railroad bridge over the Missouri River assessable in Iowa may be assessed by the township assessor, though other railroad property is assessable by the executive council.[2]

In Minnesota a deed of land from a railroad to an individual contained the words, "reserving, however, to the said" grantor "a strip of land 150 ft. wide, and any greater width where necessary, for a right of way." The Supreme Court holds that this is a simple reservation, and not sufficient to warrant the railroad in taking possession of a strip of his land, and building its trade thereon.[3]

In Idaho it is ruled by the Supreme Court that where machine and repair shops are situate upon lands other than the right of way, but are connected with the main line of the railroad by side track, under Sec. 1,463, Rev. St., they should be assessed by the local assessor rather than by the territorial board of equalization.[4]

Carriers of Goods and Injuries to Property.

In Wisconsin it is held that carriers of live stock are subject to the liabilities of common carriers of goods, and that where a shipper applies to a railroad for cars to be furnished, at a time and station named, for transportation of stock, it is the duty of the company to inform the shipper within a reasonable time whether it is able to furnish such cars as required, and if it fails to give such notice, and the shipper, relying upon the conduct of the company, has his stock at such place on time, and no cars are there for their transportation, such company is liable to such shipper for damages. In this case it appeared that the stock in question arrived in Chicago on Friday, in time for the Saturday market, but plaintiffs did not sell such stock, but kept them over Sunday. The Supreme Court holds that there could be no recovery for any expense of keeping the stock, their depreciation in value, or their shrinkage in weight, after Saturday.[5]

In Missouri the Supreme Court in construing the statute of that state as to discriminations and rebates, says: "Where a lower rate is given by a railroad company, engaged as a common carrier, to a favored shipper, which is to give, and necessarily gives, an exclusive monopoly to the favored shipper, affecting the business and destroying the trade of other shippers, the latter have a right to require an equal rate for all, under like circumstances. Where such a corporation, as a common carrier, in consideration of the fact that a shipper furnished a greater quantity of freight than other shippers, during a given term, agrees to make a rebate on the published tariff rates on such freights, to the prejudice of like freight under the same circumstances, such a contract is an unlawful discrimination in favor of the larger shipper, tending to create monopoly, destroy competition, and injure, if not destroy, the business of smaller operators, and is contrary to public policy, and will be declared void at the instance of parties injured thereby. . . . A common carrier has the right to contract to ship freight at a lower rate that the published tariff rate if he choose to do so, and such a contract is not against public policy unless the privilege to ship at such rate is granted exclusively to the shipper with whom it is made or is denied to other shippers. It is the exclusiveness of the privilege granted to one and denied to another which makes the discrimination and renders the contract void as against public policy."[6]

In Pennsylvania it is held that the statute of that state forbidding railroad companies from "passing through * * * any dwelling-house in the occupancy of the owner or owners thereof, without his, her, or their consent" embrace some of the curtilage, but only so much as is necessary to the enjoyment of the house, and not to that which is desirable or convenient, or which depends alone upon the will of the owner. In this case the route of a railroad was located through ground adjoining but not within the same inclosure as a dwelling-house; the house was 100 feet from the railroad at its nearest point; the route of the carriage way to the dwelling was unchanged; access to a spring-house separated from the house by the railroad was not interfered with; no outbuilding was taken; the barn was fifty feet from the track, and the railroad was not between the house and the barn. The Supreme Court refuses to enjoin the railroad.[7]

In the same state the Supreme Court rules that in order that two properties having no physical connection may be regarded as one in the assessment of damages for right of way, they must be so inseparably connected in the use to which they are applied that the injury or destruction of one must necessarily and permanently injure the other.[8]

In the same state the court holds that where a railroad company having by its charter power to take land for a double track if it desires, builds a single track line through lands and takes a release which contains no description and puts upon the owner of the land the duty to build and maintain the fences, and he builds the fences immediately and maintains them for a long term of years, a presumption arises that the right of way is limited to the strip of land so fenced. Unless this presumption is rebutted the railroad cannot encroach beyond the fences for the purpose of building an additional track without making or securing compensation to the owner. Mere proof that soon after the road was built the president reported to the stockholders that a right of way for a double track had been secured for the whole line will not rebut the presumption.[9]

Injuries to Passengers, Employes and Strangers.

In Massachusetts a laborer employed by an elevator company was engaged in work connected with unloading grain from two railroad cars standing, with brakes set, on a track in the elevator building. Other cars were sent in on the same track by the railroad company without reasonable warning, and with such force that the standing cars were set in motion, and, when they were brought to a stand again, the laborer's dead body was found on the track, with a broom in his hand. No one saw him go upon the track, or saw him struck by the cars. It appeared that it was part of the duty of the laborer engaged in unloading grain to sweep up, with a broom, grain which fell on the track. The Supreme Judicial Court holds the railroad company responsible.[10]

In Pennsylvania the Supreme Court lays it down that a railroad company is not required to provide the very best machinery procurable, or that combining the latest devices or improvements, but only such as is reasonably safe and in common use. If it employs competent car inspectors, and affords them reasonable opportunities and facilities for the work of inspection, it will not be liable for the negligent performance of the work, to a fellow-employé, unless the company knew, or by ordinary diligence ought to have known, of the defective manner in which the inspection was conducted.[11]

In the same state the same court rules that a track laborer who, to avoid a passing train, steps from one track to another instead of to the side of the track, assumes the risk of injury from trains on the other track; and for his death by being struck by such a train his widow and children cannot recover from the railroad company.[12]

In Michigan the plaintiff, on a dark and rainy night, after leaving a depot, but while still on its grounds, fell into a hole and permanently injured his ankle; the hole was close to the culvert of a diagonal path, on which he was walking; there were no lights, fence or guard to warn or prevent passengers from falling into it; and the railroad had constructed another and safer way of exit from the depot, but most of the travel went over the way taken by plaintiff, and the railroad's agents and employés used it and never objected to its use by passengers. The Supreme Court holds the railroad liable.[13]

In Wisconsin it appeared that at the place of the accident the track was open and straight, and an approaching train could have been easily seen by any one in front of it; that the deceased knew that the train was due at that place, and had reason to expect it, yet did not stop to listen or look, but attempted to cross the track within 40 ft. of the engine. There was contradictory evidence as to any want of care on the defendant's part. The Supreme Court rules that the railroad is not responsible.[14]

In the District of Columbia a verdict against a railroad for running into a wagon at a crossing and injuring the driver is affirmed on the ground that the engineer of the train had not given adequate notice of its approach.[15]

[1] Crane v. C. & N. W. R. Co., 37 N. W. Rep., 397.
[2] Mo. Val. & B. R. Co. v. Harrison, 37 N. W. Rep., 372.
[3] Carlson v. Duluth S., L. R. Co., 37. N. W. Rep., 341.
[4] Oregon S. L. R. Co. v. Yeates, 17 Pac. Rep., 457.
[5] Ayres v. C. & N. W. R. Co., 37 N. W. Rep., 432.
[6] Christie v. Mo. Pac. R. Co., 7 S. W. Rep., 567.
[7] Damon v. B. & Phila. R. Co., 11 Cent. Rep., 761.
[8] Potts v. Penn. S. V. R. Co., 11 Cent. Rep., 818.
[9] West Chester & Phila. R. Co. v. Soddard, 11 Cent Rep., 829.
[10] Maguire v. Fitchburg R. Co., 6 N. Eng. Rep., 59.
[11] Phil. & Read. R. Co. v. Hughes, 11 Cent. Rep., 823.
[12] Shea vs. Penn. R. Co., 11 Cent. Rep., 769.
[13] Cross v. L. S. & M. S. R. Co., 37 N. W. Rep., 361.
[14] Shelling v. C., M. & St. P. R. Co., 37 N. W. Rep., 414.
[15] Johnson v. Balt. & Pot. R. Co., 11 Cent. Rep., 720.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Central Pacific, 1 per cent., payable Aug. 1 to stockholders of record July 20.

Central Ohio, 3 per cent. upon the common and preferred stock, payable July 31 to stockholders of record July 15.

Marquette, Houghton & Ontonagon, semi-annual, 3 per cent. upon the preferred stock, payable Aug. 15 to stockholders of record Aug. 9.

Pittsburgh & Lake Erie, 3 per cent., payable July 24.

Rome, Watertown & Ogdensburgh, 3 per cent., payable Aug. 15 to stockholders of record Aug. 1.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlanta & West Point, annual meeting, Atlanta, Ga., Aug. 5.

Boston, Hoosac Tunnel & Western, annual meeting, Saratoga Springs, N. Y., Aug. 15.

Duluth, South Shore & Atlantic, annual meeting, Marquette, Mich., July 19.

Evansville & Terre Haute, special meeting, Evansville, Ind., July 21.

Marquette, Houghton & Ontonagon, annual meeting, Marquette, Mich., July 19.

Rutland, annual meeting, Rutland, Vt., July 26.

Troy, Saratoga & Northern, annual meeting, Saratoga Springs, N. Y., Aug. 15.

Western & Atlantic, annual meeting, Atlanta, Ga., Aug. 5.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Railroad Accounting Officers will meet at the Hotel Brunswick, New York City, July 25, to organize a permanent association.

The *Roadmasters' Association of America* will hold its next convention at Washington, D. C., Sept. 11.

The *New England Roadmasters' Association* will hold its sixth annual convention at Boston, Mass., Aug. 15–16.

The *National Association of General Passenger and Ticket Agents* will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The American Society of Mechanical Engineers will hold its eighteenth convention and ninth annual meeting in Scranton, Pa., beginning Monday evening, Oct. 15.

The *Claim Agents' Association* will hold its annual fall meeting at the International Hotel, Niagara Falls, N. Y., on Thursday, Aug. 2.

The *American Association for the Advancement of Science* will hold its thirty-seventh meeting in Cleveland, O., Aug. 15 to 21. The headquarters will be at the Hollenden Hotel.

The *American Association of Railway Chemists* will hold its next meeting in Baltimore, Md., in October.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Western Railway Club* will hold its next meeting on the third Wednesday in September, at the Grand Pacific Hotel in Chicago.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its next regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of September.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Club of Philadelphia* will hold its next meeting in Philadelpbia, Oct. 6.

The Engineers' Society of Western Pennsylvania will hold its next meeting in Pittsburgh, Sept. 18.

The Engineer's Club of Kansas City will hold its next regular meeting Sept. 3.

The Convention of Accounting Officers.

Delegates from that class of railroad officers whom one of the New York papers calls "railroad men who do sums," met Wednesday, July 25, in New York, and effected a permanent organization. Mr. M. Riebenack (Pennsylvania) was chosen temporary chairman, and Mr. C. J. Philips (Chicago & Northwestern) temporary secretary. The association was organized under the name, "The Association of American Railway Accounting Officers." A constitution and by-laws were adopted. The session was then adjourned to Thursday morning, when permanent officers were to be elected. About 75 delegates were in attendance.

PERSONAL.

—Mr. Colgate Hoyt has resigned his position as a director in the Union Pacific.

—Gen. William C. Wickham, Receiver and Second Vice-President of the Chesapeake & Ohio, died at his office in Richmond, Va., suddenly on Monday. Gen. Wickham has held several positions of importance on the Chesapeake & Ohio system. He was also very prominent in politics, and opposed the secession of the state. He entered the Confederate army, however, and was made Brigadier General. At the time of his death he was a member of the State Senate.

—Walter McFarland, Lieutenant Colonel Corps of Engineers, U. S. A., died July 22, at his home in New London, Ct., from rheumatism of the heart. Colonel McFarland was graduated from the West Point Military Academy in 1860. He served during the war with distinction as an engineer officer. Never having been in command of troops he had no opportunity to make his name widely known, but his fame among the officers of his own corps and with professional men in civil life is sound and enduring.

—James T. Clark, General Superintendent of the Chicago, Milwaukee & St. Paul Railway, died in Milwaukee on the evening of July 21. He had lately been making a tour of inspection over several of the Eastern roads, accompanied by several of the division superintendents. It was on this journey that he was taken sick with what proved to be peritonitis, and he was at once taken to his home in Milwaukee. Mr. Clark was a native of Ohio and was 56 years old at the time of his death. His whole life had been spent in railroad work, having begun in the humblest way. He was for 20 years on the Chicago, Burlington & Quincy and was later General Superintendent of the Union Pacific, from which road he went to the Chicago, Milwaukee & St. Paul. He was a man of fine reputation as a railroad officer and, indeed, was ranked among the first-class railroad superintendents.

—C. C. Vermeile and J. R. Bien have formed a partnership as civil and mining engineers, with office at 80 Broadway, New York. Mr. Vermeile has been in charge of the Topographical Survey of New Jersey, which has just been completed. He was also Topographer of the United States Geological Survey for four years, which position he recently resigned. Mr. Bien has also been connected with the United States Geological Survey, and recently completed a survey of Yellowstone Park.

H. P. Stanwood, General Agent of the Chicago & Northwestern on the Pacific Coast, died suddenly in San Francisco, July 16. He was connected with the company for 25 years.

William A. Caul, Superintendent of the Cincinnati, Wabash & Michigan Railway Co., died July 16, after a short illness. He was 29 years old.

Gen. Annenkoff, the constructor of the Transcaspian Railway, has received the decoration of the Order of Alexander Nevsky in recognition of his services in building the line.

ELECTIONS AND APPOINTMENTS.

Canaveral & South Florida.—The following officers have been elected: N. N. Penny, President; W. D. Wesson, Vice-President; Henry T. Harrison, Secretary and Treasurer; Robert Ranson, Chief Engineer. The general office is in Canaveral, Fla.

Champlain Junction.—At a meeting of the directors recently Joseph Hickson, General Manager of the Grand Trunk, was elected President, and the Hon. Mr. Starnes chosen to fill the vacancy in the board caused by the death of the Hon. Senator Ferrier.

Chicago, Burlington & Quincy.—J. G. Palmer has been appointed General Southern Agent, with headquarters at New Orleans.

DePue, Ladd & Eastern.—The following are the incorporators of this Illinois company: Albert L. Sweet and Thomas Lemmor, of Chicago; George L. House, of Joliet, and W. S. Cherry, of Streator.

Dodge City, Montezuma & Trinidad.—The following directors have been elected: A. T. Soule, C. D. Perry, R. R. Hudson, W. W. Munsell and J. W. Gilbert. A. T. Soule, of Rochester, N. Y., is President and W. W. Munsell, of Dodge City, Kan., is Secretary and Treasurer.

Grand Trunk.—A. H. Smith, formerly Assistant Mechanical Superintendent, has been appointed to take charge of the mechanical departments of the southwestern and northern divisions, with headquarters at Toronto. Peter Clarke, formerly Mechanical Superintendent of the Northern Railway, will have charge of the mechanical department of the Grand Trunk from Toronto to Kingston, with office at Toronto.

Hartford & Connecticut Western.—At a meeting of the directors last week, John W. Brock, of Philadelphia, and Julius H. Appleton, of Springfield, Mass., were elected directors, in place of Thomas W. Cornell and Edward W. Spurr, resigned. The new directors are interested in the Poughkeepsie bridge.

Iron.—The annual meeting was held last week and the old officers were re-elected with the exception that A. Eugene Sargent was elected Secretary and Treasurer, with office in Boston, Mass., to succeed John A. Folsom, deceased.

Kansas City, Lawrence & Nebraska.—The following officers and directors were elected at a meeting held in Lawrence, Kan., July 18: President, H. M. Holden; Vice-President, J. M. Webster; Treasurer, I. N. Van Hosen; Secretary, John Jewett. Directors: W. H. Chick, H. Holden, O. F. Richards, W. P. Rice, C. E. Blackman, J. P. Powell, I. N. Van Hosen, F. S. Woodruff, F. W. Bartelde, E. D. Thompson, J. M. Webster, Osburn Shannon, Geo. M. Jewett, H. J. Jewett and J. J. Wemple.

Lake Shore.—The annual meeting was held in Laconia, N. H., July 18, and the following were elected directors: Charles A. Busiel, Charles E. Tilton, Hiram Hull, Frank W. Rollins, John Kimball, Amos. L. Rollins and Samuel C. Clark. The directors organized with Charles A. Busiel, of Latonia, President, and Frank S. Streeter, of Concord, Secretary.

Leesburg, Lisbon & Palatka.—The incorporators of this company are: J. S. Hooper, W. D. Wendenhall, A. J. Cassidy and others, of Leesburg, Fla.

Louisville, Evansville & St. Louis.—Joseph S. Odiorne, late paymaster and cashier, has been appointed general passenger agent, vice G. W. Curtis, resigned. Morris McDonald, Jr., has been made paymaster.

Louisville & Nashville.—The office of Assistant Superintendent of the South & North Alabama Division has been abolished. W. G. Sala has been appointed Assistant Superintendent of the Birmingham Mineral.

Midland (Indiana).—H. B. Halsted has been appointed General Ticket and Freight Agent, to succeed T. C. Cooper, resigned.

Missouri Pacific.—George W. Cook has been appointed General Western Agent, with headquarters in Denver, Col. J. O. Phillippi has been appointed Assistant General Freight and Passenger Agent north of Atchison, Kan., with headquarters in Omaha, Neb.

Missouri, Tennessee & Alabama.—Thomas W. Neal, J. E. Richardson, John M. Nichols and R. W. Fleming are incorporators of this Tennessee company.

Monson.—W. L. Estabrooke has been appointed Superintendent, with office in Monson, Me.

New York, Pennsylvania & Ohio.—Thomas O'Brien has been appointed Master Car-builder of the shops at Galion, O.

New Westminster, Bellingham Bay & Seattle.—The following officers have been elected: Eugene Canfield, Seattle, President; C. M. Sheafe, General Manager; W. A. Jones, Chief Engineer; Arthur Hill, J. T. Sheet and J. C. Scurry, Assistant Engineers. The general office is at New Westminister, B. C.

Norfolk & Western.—The following changes and appointments to the divisions recently established have been made: E. L. De Barry, Superintendent of Eastern Division from Norfolk to Crewe, headquarters Crewe, Va., to succeed N. M. Osborne, made General Agent; J. C. Cassell, Superintendent of Lynchburg Division, from Crewe to Roanoke, headquarters Roanoke, Va.; J. A. Hardy, Superintendent of Radford Division, from Roanoke to Bluefield, headquarters Roanoke, Va.; J. G. Osborne, Superintendent of Western Division, from Radford to Bristol, including the Cripple Creek Extension, headquarters at Radford; W. L. Keen, Division Engineer at Norfolk; N. L. Snowden, Supervisor of Eastern Division, with headquarters at Petersburg; W. H. Stanley, Supervisor of Lynchburg Division, with headquarters at Radford; B. F. Stanley, Supervisor of Western Division, with headquarters at Wytheville; H. N. Crage, Supervisor of the Cripple Creek Extension, with headquarters at Radford.

Northern Pacific.—Robert Law, Superintendent of the Montana division of the Northern Pacific, has been appointed Assistant General Manager of a new division, extending from Billings to Heron, with headquarters at Helena.

Northwest & Florida.—The stockholders of this company, which succeeds the Montgomery & Florida, have elected the following board of directors: Nathan T. Sprague, Thomas G. Ritch, David A. Boody, Frederick F. Thompson and Stewart L. Woodford, of Brooklyn; Joseph W. Dimmick, James A. Farley, Mordecai Moses and William A. Gayle, of Montgomery. The directors have chosen the following officers: President, Nathan T. Sprague, of Brooklyn; Vice-President, Joseph W. Dimmick, of Montgomery; Treasurer, David A. Boody, of Brooklyn; Secretary, Remson Pushmore, of Brooklyn; General Superintendent, Bradford Dunham, of Montgomery.

Orford Mountain.—A meeting of the stockholders was held at Waterloo, P. Q., July 17, and the following directors were elected: Hon. G. G. Stephens, Hon. W. W. Lynch, Judge S. W. Foster, George G. Foster, W. H. Robinson, Gardner Stevens, William Warren and J. M. Brown, and T. B. de Gros Bois, M. P. P. At a meeting of the directors held subsequently the Hon. G. G. Stevens was elected President, Hon. W. W. Lynch, Vice-President; Judge S. W. Foster, Managing Director, and Gardner Stevens, Secretary and Treasurer.

Rome.—The following officers were elected at a special meeting of the stockholders held last week: President, J. D. Williamson; General Superintendent, George D. Lawrence; Directors, J. D. Williamson, W. W. Brooks, David Bukofzer, R. J. Camp, D. B. Hamilton, J. B. S. Holmes, R. T. Fouche. The majority of the stock was recently purchased by the Chattanooga, Rome & Columbus.

Rome & Decatur.—B. A. Bacon is now General Superintendent of this road. P. H. Thomson has been appointed Chief Engineer, and S. Z. Russ, Engineer of Construction. The general offices are in Rome, Ga.

San Antonio & Aransas Pass.—C. A. Merriam has been appointed General Superintendent, and will have charge of the operating and maintenance of way departments. The office is a new one.

San Pete Valley.—The annual meeting was held in Nephi, Utah, July 14, and the following directors were elected: Charles Pasley, A. G. J. Ponsonby, J. B. Blair, George Cullins, Parley L. Williams, C. F. Annett and Theodore Brubback. The directors elected the following officers: President and General Manager, Theodore Brubback; Vice-President, Judge J. B. Blair; Secretary and Treasurer, N. S. Kerr.

Shreveport Railroad & Land Co.—The stockholders have elected the following officers: S. B. McCutchen, President; John S. Young, Vice-President; F. G. Thatcher, Secretary; H. Sour, Treasurer. Directors: S. B. McCutchen, John S. Young, Hermann Zodiag, John R. Jones and M. L. Scovell.

Sonora, Sinaloa & Chihuahua.—The incorporators of this new Mexico company are H. B. Ferguson, J. A. Williamson, Boston; John A. Lee and W. S. Strickler, Albuquerque, N. M.; Louis Haller, City of Mexico, Mexico; George H. Sisson and J. C. Tiffany, New York City.

South Brunswick Terminal.—The incorporators of this Georgia road are: W. F. Penniman, Mallory P. King and Henry R. Symons.

Texas, Santa Fe & Northern.—E. Lewis has been appointed Superintendent, with office in Santa Fe, N. Mex., to succeed E. R. Dougherty, resigned, to engage in mining interests.

Wharton Valley.—The officers of this new company are: P. Barrett, President; J. Burton, of New York, Secretary and Treasurer; E. Canfield, Chief Engineer.

OLD AND NEW ROADS.

New Companies Organized.—DePue, Ladd & Eastern.—Leesburg, Lisbon & Palatka.—Missouri, Tennessee & Alabama.—Northeast & Florida.—Orange, Hammond & St. Johns.—Portland & Mount Hood.—Sonora, Sinaloa & Chihuahua.

Alabama Great Southern.—A meeting of the stockholders will be held in Birmingham, Aug. 6, to vote on a proposition to issue £1,600,000 bonds.

Albemarle & Pantego.—Grading is now in progress on this road from Juniper Landing south toward Pantego, N. C., 20 miles distant, to which point location has been finished. At Mackey's Ferry, the northern terminus, freight is transferred by car floats to the Norfolk Southern at Edenton. The road gives a short route between Albemarle and Pamlico Sounds.

Alexandria & Charleston.—The company has been incorporated to build a road from Alexandria to Charleston, W. Va., an estimated distance of 300 miles. John S. Barbour, of Alexandria, has been elected President.

Austin & Northwestern.—The survey is now being made for the extension from near Marble Falls to Llano, Tex., about 36 miles, which was mentioned in these columns some time ago. H. L. Higden is in charge of the party.

Baltimore & East Shore.—It is reported that work will soon be commenced on this Maryland road. The Wicomico & Pocomoke, which extends from Salisbury to Ocean City, Md., 30 miles, is now controlled by the company and will form part of the proposed line. B. Seth, of Easton, Md., is President.

Belmont & Harpeth River.—The bill for granting this company right of way through the City of Nashville, Tenn., has been referred to a special committee, and if a favorable report is made the building of the road will be at once commenced. The road is to run from Nashville in a southwest direction about 9½ miles. It has not been decided whether to use dummy engines or electric motors.

Birmingham Mineral.—The contract has been let to Thornton & Glenn, of Birmingham, for furnishing 55,000 ties to be used on the extension towards Huntsville, Ala., and to be delivered within 60 daps.

Cairo, Tennessee River & Cumberland Gap.—The survey was commenced July 18 near Cairo, Ill., and will be completed as rapidly as possible to Hopkinsville, Ky.

Central of New Jersey.—It is reported that about 26,000 shares of stock, held in the interest of the Lehigh Valley, have been sold to the Philadelphia & Reading.

Chesapeake, Ohio & Southwestern.—A second survey is now being made for the extension from Paducah, Ky., to Cairo, Ill., a distance of about 30 miles.

Chicago & Northwestern.—The road has been granted permission to extend its tracks in Racine, Wis., through some of the most important streets of the city into the heart of the manufacturing centre. The main track at present lies considerably west of the business portion.

Chicago & South Side Rapid Transit.—The officers of the company this week deposited a certified check for $100,000 with the City Treasurer of Chicago, as required in the ordnance giving right of way through certain streets of the city. Condemnation proceedings have been commenced.

Chicago & Western.—A meeting of the stockholders has been called for Aug. 1 to surrender the charter to the state. The road was about 1½ miles of double track and switches, and connected the Chicago, Milwaukee & St. Paul and Panhandle roads with Coxe Brothers & Co.'s coal yards at Morgan street. The tracks were removed from the street crossings about six months ago by order of the City Council.

Cleveland, St. Louis & Kansas City.—It is stated that arrangements have been consummated for placing first mortgage bonds. The company proposes to build a line from St. Louis to Kansas City, and it is thought that work will begin in August.

Columbia & Puget Sound.—The company has filed with the Secretary of Washington Territory a copy of a resolution of the stockholders, increasing the capital stock from $575,000 to $1,000,000.

Cornwall & Lebanon.—It is reported that the company is negotiating to secure a controlling interest in the Wilmington & Northern. The road extends from Wilmington to Reading, Pa., to which point this road has surveyed an extension.

De Pue, Ladd & Eastern.—Articles of incorporation filed in Illinois to construct a road from De Pue, Bureau County, through Seaton and Ladd to a connection with the Illinois Central, between La Salle and Mendota. Branches are also proposed to Laceyville, and to a point on the Chicago & Northwestern, near Spring Valley. The capital stock is placed at $30,000, and the principal office will be in Chicago.

Elkhart & Western.—The survey for the road from Elkhart to Mishawaka, Ind., about 11 miles, has just been completed, and the contract for constructing the road will be let in a week or two. The roadbed is very level, and will require but little grading, and it is expected to have the road ready for tracklaying within 30 days after grading has been commenced. E. C. Bickel, Elkhart, Ind., is General Manager.

Houston, Central Arkansas & Northern.—Grading has been commenced between Monroe and Bastrop, La., and about miles are reported completed.

Kansas City & Pacific.—It is stated that grading will soon be commenced on the extension from Vance northeast about 30 miles to Paola, and completed this year. The extensions to Kansas City and through the Indian Territory are to be postponed till next year.

Leesburg, Lisbon & Palatka.—A company has been organized under this name in Florida to build a road from Leesburg, Lisbon and Grahamville to Palatka.

Long Island.—The stockholders, at a meeting this week, approved the issue of $3,000,000 four per cent. bonds for

improving terminal facilities, constructing branch to Oyster Bay and providing new rolling stock.

Marshall, Paris & Northwestern.—The stockholders, of the company, which has been reorganized as the Paris, Marshall & Sabine Pass, have authorized the issue of $8,000,000 first mortgage bonds, and they will be issued about Aug. 10.

Mexican National.—Work on the road is being pushed very rapidly and it is expected that the gap between Acambro and Elsalado will be closed by Sept. 1, and the road opened for through traffic by Sept. 6.

Missouri, Tennessee & Alabama.—Charter filed in Tennessee, to build a road from a point in Missouri or Arkansas through Dyersburg, Alamo and Jackson, to a point in Northern Alabama.

Montana, Kansas & Texas.—The survey from Albany through Coleman and Brady to Mason, Tex., has been completed.

Montgomery & Florida.—The company has been reorganized as the Northwest & Florida.

Nashville & Knoxville—The contract for constructing 22 miles of road from Caney Fork River has been sublet to J. B. Rodemer & Co.

Nashville Marginal.—The company has applied to the City Council of Nashville, Tenn., for a charter to construct a belt road around the city.

New Roads.—A survey has been made for a proposed road from Morgantown, Ky., to a connection with a branch of the Owensboro & Nashville by P. H. McMichael, of Louisville. The distance is about 20 miles. An effort is being made to obtain subscriptions in Morgantown and Butler County to aid in building part of the road.

New Westminster, Bellingham Bay & Seattle.—An election is soon to be held in New Westminster, B. C., to vote on the proposition to grant a subsidy of $250,000 to the Bellingham Bay Railway & Navigation Co., which is to build this road. Grounds for depot, car shops and other buildings, to give employment to 200 men, are also asked. The engineers are now surveying north from Seattle toward Whatcom, W. T., and a line will also soon be run south from New Westminster through Hope and toward Whatcom.

New York, Mahoning & Western.—Tracklaying was completed from Ottawa to Findlay, O., last week, and an excursion train was run over the route July 22.

Norfolk & Western.—The company is negotiating with the Richmond Terminal & Warehouse Co. for the sale to it of the preferred stock of the East Tennessee, Virginia & Georgia, held by the Richmond Terminal. A committee of directors of the latter company have been appointed to confer with the Norfolk & Western management. The Richmond Terminal holds $6,500,000 of the stock, a controlling interest, and the price at which it is offered is said to be 115.

Northern Pacific.—The company has applied for an injunction from the courts at Spokane Falls, W. T., restraining the Oregon Railway & Navigation Co. from crossing the territory around Kingston with its branch line. Both companies have large forces grading lines into the Cœur d'Alene mining district in Montana.

Northwest & Florida.—The company has been organized in Alabama, and has purchased the franchise of the Montgomery & Florida, recently sold under foreclosure. The capital stock of the new company has been placed at $1,800,000.

Orange, Hammond & St. Johns.—Charter filed in Florida to build a road from a point near Altoona to the St. Johns River, a distance of about 25 miles. J. C. Bryson, A. H. Cole and others, are incorporators.

Oregon Railway & Navigation Co.—Kirkpatrick Bros. & Collins, of Beatrice, Neb., have secured a contract from this company to build 140 miles of its branch line into the Cœur d'Alene mines.

Oregon & Washington Territory.—Track is now being laid on this new line at the rate of a mile a day. Twenty-five miles have been graded, and 17 miles of track have been laid. The line is expected to be completed to Walla Walla, W. T., by Jan. 1, 1889.

Pennsylvania.—The contract for building the new paint shop in Altoona, Pa., has been awarded to Hoover & Hughes, of Phillipsburg, Pa. The contaact price is $137,000.

Pennsylvania, Poughkeepsie & Boston.—It is announced that traffic contracts over the road and the Poughkeepsie Bridge have been signed by the Central of New Jersey, Lehigh Valley, Lehigh & Hudson, and New York, Ontario & Western roads. The bridge is expected to be completed in four weeks, and the approaches in three months.

Port Jervis, Monticello & New York.—Judge C. F. Brown, in Supreme Court Chambers at Newburg, N. Y., this week granted the application made by this road for a temporary injunction restraining the New York, Lake Erie & Western from excluding the road from the Erie terminals at Port Jervis. The Port Jervis, Monticello & New York had been paying $100 monthly as rental for the use of the terminals until last spring, when the rental was raised to $300. This was paid one month under protest, and a suit was instituted to determine the legality of any rental, as it was agreed when the Port Jervis & Monticello was built that no rental was to be charged, and pending decision in this suit no rental has been paid. The Erie took this as a cause for shutting out the road. It was ruled that $100 be paid monthly for the use of the terminals until the suit is decided.

Portland & Mt. Hood.—Organized in Portland, Ore., to build a road from Portland to Mt. Hood, a distance of about 70 miles from Portland. The capital stock is $1,000,000.

Portland & Vancouver.—Over 150 men are at work on this short road, and much of the grading from Portland, Ore., to the Columbia River, has been finished. The rails for 10 miles of the road have arrived, and will be immediately laid. Connection is to be made with Vancouver, Wash. Ter., by ferry, and a trestle 8,000 ft. long is being constructed from the south shore of the Columbia.

Port Townsend Southern.—The preliminary survey was commenced at Port Townsend, Wash. Ter., last week, and will be continued rapidly to the Columbia River. R. C. Andrews, of Seattle, is Chief Engineer.

Ripley & Mill Creek Valley.—Grading on this road between Millwood and Jackson, C. H., W. Va., has been nearly completed, and tracklaying will commence about Aug. 1. It is expected to have it completed by Oct. 1.

Rome & Decatur.—Tracklaying on the gap of four miles, near the Coosa River, is expected to be finished this week. The road is standard gauge, and extends from Attalla, Ala., to Rome, Ga., and it is expected to put on passenger trains the latter part of August.

San Antonio & Aransas Pass.—President Lott has agreed to build the proposed extension to Brownsville, Tex., if the right of way, depot grounds in Brownsville and a bonus of $150,000 are granted. The branch to Rockport has been put in operation.

Sandusky, Ashland & Coshocton.—The directors have decided to issue a new mortgage for $6,000,000 on the proposed line, in place of the mortgage previously authorized. The general offices are to be removed to Sandusky from Ashland.

San Francisco, Clear Lake & Humboldt—President W. H. H. Hart has returned from Chicago, where he consulted with Gen. McNulta, who is interested in the project. He says that nothing will be done for the next two or three months, at least, and that even then, if the subsidies are not renewed, and six months' allowance of time be given, the probability of the road being built is very doubtful.

Seattle, Lake Shore & Eastern.—The first regular train over the Seattle & West Coast road, the northern branch of the Seattle, Lake Shore & Eastern, made the run on Monday, July 16, from Seattle to Snohomish City. W. T., a distance of 23 miles. The contract for building 10 miles north from Snohomish has been let to Thomas Earle and J. W. MacLeod, with a privilege of 30 miles more.

This company has a force of 25 teams at work on the Grand Coulee crossing in Eastern Washington territory. The Northern Pacific has surveyors at the same place, and will soon put on a force of graders. Both companies are rushing for positions of vantage in that location. About 45 miles of the road west from Spokane Falls are now completed.

Sonora, Sinaloa & Chihuahua.—Incorporated in New Mexico to build a road from Deming, N. M., to Alamos, in the state of Sinalo, Mexicoa, and thence to Guaymos in the state of Sonora. The capital stock is $20,000,000 and the company has a subsidy of $3,000 a mile from the Mexican Government.

South Bound.—The preliminary surveys from Columbia, S. C., to Savannah, Ga., will soon be commenced under Thomas B. Lee, Engineer. John L. Hammond, of Savannah, is President.

Southern Pacific.—On the extension down the San Joaquin Valley from Tracy, recently opened as far as Newman, Cal., 37 miles from Tracy, tracklaying has now been completed for about eight miles additional. The line will rejoin the Southern Pacific at Sumner, about 235 miles from Tracy.

Southern & Western Air Line.—About 10 miles of grading has now been completed on this road from near Shelby toward Cranberry, N. C.

Tennessee Central.—The survey has just been completed for the extension from Jewett northwest to Crossville, Tenn., a distance of 17⅛ miles. The contract will not be let before Sept. 10.

Troy & Boston.—The Attorney-General of New York has begun an action for dissolution of the company, and for the appointment of a Receiver to wind up the affairs of the company. The complaint alleges that the company has suspended ordinary and lawful business for at least a year; that it was solvent at the time of its consolidation with the Fitchburg, and that it made itself insolvent by dividing property among its stockholders that was needed to pay its debts. The Fitchburg is made a defendant as a necessary proceeding, but no claim is made against that company.

Upper Coos.—A force of 700 men is reportd at work on the extension to a connection with the Quebec Central, which is being built under the name of the Hereford Railroad. It is expected to have the line completed before November.

Waco & Brazos Valley.—The contract for grading the road from Waco to Cameron, Tex., 53 miles, is reported let to J. Brannor, of Houston, and F. F. Jones, of Waco, Tex.

Western Maryland.—The contract has been let to Keller & Crosson, of Lancaster, Pa., for building the extension of the Baltimore & Harrisburg Division, from Orluana, Pa., southwest to Blue Ridge Summit, Md., near the state line. The distance is 15 miles. There is a 500 ft. tunnel on the route, and the road, including bridges, etc., will cost about $200,000.

Winona & Southwestern.—The contract for grading the first 20 miles of the road from Winona, Minn., toward Mason City, Ia., has been let to Foley Bros., of St. Cloud, Minn. The contract for bridging has been let to Donald Grant, of Faribault, Minn. Sub-contracts have been let to W. H. H. Spofford, of Winona, and Burke Bros., of West Virginia.

Yankton & Norfolk.—The right of way from Yankton to Norfolk, Dak., is said to have been all secured. The locating survey will probably soon be commenced.

TRAFFIC AND EARNINGS.

The Inter-state Commerce Commission.

TRANSPORTATION OF OIL.

In the case of William C. Scofield *et al.* vs. The Lake Shore & Michigan Southern Railway Co., decided by the Inter-state Commerce Commission, July 18, the conclusions of the Commissioners are as follows:

So much of the complaint as alleges unjust discrimination in favor of oil shipped in tank cars is sustained, and it is the duty of the defendant to give, and it must give the same rates on oil shipped in barrels in car-load lots that it charges upon oil in tanks.

So much of the complaint as alleges unjust discrimation between oil shipped in barrels in car-load lots and less than car load lots is not sustained.

So much of the complaint as seeks an order from the Commission requiring the defendant to furnish tank cars for the transportation of oil for the petitioners and the public is not sustained.

The order of the Commission is that the defendant, the Lake Shore & Michigan Southern Railway Co., must from and after the receipt of this notice charge the same rates on oil shipped in barrels in car-load lots in stock cars and other cars that it charges upon oil in tanks—by the pound, and not by barrel.

In support of this conclusion the Commissioners say that in every instance a large difference is made in the rate per barrel in favor of oil in tank cars as against oil in barrels in car-load lots. This, too, when, as the evidence shows, there is frequently return freights from Chicago to Cleveland for stock cars and no such return loads for tank cars. There is no just and substantial ground for this difference, so far as we can see. By this arrangement the carrier hauls in one tank car ninety barrels of oil as the lowest minimum and in a stock car sixty barrels as the minimum. Beside the large differences made in favor of oil per barrel in the tank car as against oil per barrel in the stock car, each being in direct competition, whenever there is a return load for the stock car the actual revenue would be proportionately greater to the carrier upon the entire transaction from the stock car than from the tank car. The preference thus given to oil shipped in tank cars as against oil shipped in stock cars in car-load lots is, we think, unlawful, and must be regarded as forbidden by the Act to regulate commerce. The defendant should carry the same weight for the same price in the one car as in the other, and the rate should be made by the hundred pounds instead of by the barrel.

The element in this transaction that produces this large difference in rates is the tank. It confers an advantage upon the shipper who uses it, transporting from one-third to twice as much oil more than is shipped by the shipper in the stock car, with but little difference in the aggregate car rate for this large excess of oil. The tank is indeed the car, but in renting it from the shipper to haul his own oil the carrier pays him for furnishing a package for the oil, charges him nothing for the increased dead weight of the tank over and above that of the stock car, which upon an average is one thousand pounds, and pays him rental for hauling the empty tank car back to him as part of the transaction. The shipper of oil in car-load lots in barrels pays for the full weight of the barrel in every instance, as well as the oil, and furnishes the barrels himself, and if his barrels are hauled back to him he has to pay for that service as upon other freight. The inequalities of the transaction are very great, and they are all on the side of the shipper of oil in tanks.

The transportation of petroleum oils being a special traffic, as we had occasion to observe in the case of Rice *vs.* The Louisville & Nashville Railroad Company and others, it is properly the business of the carrier to supply the rolling stock for the freight he offers or proposes to carry, and if the diversities and peculiarities of the traffic are such that this is not always practical, and consignors are allowed to supply it themselves, the carrier must not allow his own deficiencies in this particular to be made the means of putting at an unreasonable disadvantage those who make use in the same traffic of the facilities he supplies. There appears to be no law that prevents a carrier in the course of his business from arranging with the shipper to furnish cars for the shipment of his own goods at terms agreed upon between him and the carrier, but in every such transaction the carrier, at his peril, must see to it that neither directly nor relatively must a better rate be given to such shipper than to others engaged in the same business, and making shipments of the same kind of goods, who are dependent on the carrier for cars. From this it follows, as we decided in Rice's case, that this carrier must make the same rates on oil, whether shipped in car-load lots in tanks or in car-load lots in barrels. The carrier, of course, has the right to charge for the weight of the barrel as part of the freight.

The Commissioners met at Dubuque, Iowa, July 25, to consider the complaint against the Chicago, St. Paul & Kansas City, of violation of the long and short haul clause. The principal argument in the first session was made by President Stickney. The facts of a greater charge for the short haul than for the long haul, which includes it, were admitted, but it was argued that such charges were made necessary by (1) the cut made by the Chicago, Burlington & Northern and (2) by the low lake and rail rates from the seaboard to St. Paul. The Chicago, St. Paul & Kansas City could not make a higher through rate and get any traffic; it could not make a lower local rate and live. Moreover, the Dubuque-St. Paul rates are not unreasonable, and to reduce them would injure parallel lines. The Chicago-St. Paul rate is unreasonably low and a proper remedy for the existing evil would be to compel the Chicago, Burlington & Northern to advance rates. This Mr. Stickney thought the Commissioners could do under the law. He did not, however, make a formal complaint against the Chicago, Burlington & Northern or define "reasonable rates."

THE NEW JERSEY FRUIT EXCHANGE CASE.

The Inter-state Commerce Commission has announced an opinion prepared by Commissioner Schoonmaker, dismissing the complaint of the New Jersey Fruit Exchange against the Central Railroad Co. of New Jersey and the Lehigh Valley. The point in controversy was the reasonableness of the rates on peaches from points on the defendants' lines in New Jersey to New York City, but as it was unquestionably shown by the evidence that the peaches were delivered in Jersey City, and the carriage to New York was by the consignee, the Commission holds that the transportation was entirely within the State of New Jersey, and therefore beyond its jurisdiction.

Legislative.

In the Senate, July 25, Mr. Cullom offered a preamble and resolution reciting published statements that the Minneapolis, Sault Ste. Marie & Atlantic and the Duluth, South Shore & Atlantic have passed into the control of the Canadian Pacific, that these roads control all the approaches to the bridge over the St. Mary's River, that the ownership of that bridge is also in the Canadian Pacific and that, by virtue of this monopoly, the Canadian Pacific Railway (operated in the interests of a foreign government) is able to ignore and defeat the operations of the Inter-state Commerce bill, and directing the Committee on Inter-state Commerce to inquire into these matters and whether any legislation is necessary to protect the interests of the people of the United States and to prevent the diversion of commerce from its natural and legitimate channels and to prevent the monopolizing of traffic by a foreign corporation.

Southern Railway and Steamship Association.

This Association held its fourteenth annual convention in New York, July 25, to elect officers for the year. The following were chosen: Joseph E. Brown, President; T. M. R. Talcott, Commissioner; Virgil Powers, Consulting Commissioner; Charles A. Sindall, Secretary, and John Screven, of Georgia, Thomas H. Carter, of Virginia, and E. K. Sibley, of New York, Arbitrators. The convention passed a resolution binding the various companies composing the Association to a renewal of their present agreement for the maintenance of rates for another year from Aug. 1.

Traffic Notes.

The Kansas City grain men have thought themselves discriminated against in that the sum of local rates from Kansas points to Kansas City and from Kansas City to St. Louis and Chicago, is greater than the through rates. A meeting of railroad officials and grain merchants was held in Kansas City, July 17, but no action was taken. Another meeting was held in Chicago between the grain men and Chairmen Midgely and Faithorn on the 24th and 25th

A committee of peach growers lately called on the Pennsylvania to ask lower rates. It is said the company declined to reduce rates, but will give increased facilities.

The Mexican Central and the Atchison have made a reduced excursion rate for round-trip tickets from Mexico to

Denver, Pueblo and Colorado Springs, good till September, with the purpose of encouraging summer travel.

The Nebraska roads have apparently decided to ignore for the present the schedule of rates prepared for them by the State Board of Transportation. No definite course of action has, however, yet been decided upon.

The Erie has announced its withdrawal from the weighing and inspection bureaus at Buffalo and Salamanca. General Manager Felton has telegraphed that the withdrawal is due to the expense incident to the bureau, which runs too high with the present demoralization of rates. The action thus taken does not apply to any points west of Buffalo and Salamanca.

The Lake Shore & Michigan Southern has made a milling in transit rate one and a half cents per 100 above the rate on grain from the original point of shipment to destination. This applies to wheat, corn or oats shipped in car-load lots from stations on the line, and the flour or meal must be delivered again for shipment within 30 days after the receipt of the grain at the milling point. The rate applies only to car-loads and to ground stuff destined to Buffalo, Erie or points east.

The Texas & Pacific has raised rates from New Orleans to El Paso in accordance with the decision of Commissioner Waldo, of the Texas Traffic Association. El Paso merchants fear a great diversion of Mexican trade to Eagle Pass. The Texas Traffic Association met in New York Wednesday, and it is hoped that arrangements were made to continue the organization, the term of which expires Oct. 1.

The hearing before Judge Fairall in the Iowa rate case was postponed to-day on account of the illness of the judge. This hearing is in the matter of an injunction issued forbidding the promulgation by the State Commissioners of the rates fixed by them.

Iowa Rates.

Iowa shippers by advice of the State Commissioners are paying present rates under protest. Cetain railroad attorneys have been examining the Commissioners with the view to show their fitness to make transportation rates.

It was shown that the printed schedule of rates which the Commissioners sent to the roads as the new rates differed in a dozen particulars from the original copy as agreed upon by the Commissioners. When asked to explain these variations, Commissioner Smith said he did not know how they came to be made. Commissioner Smith, when questioned closely, said that a railroad rate might be just and reasonable when it did not pay the operating expenses of the road that used it. Judge Withrow then asked him who was to pay the deficit. "It's not my business to worry over that," was his reply.

Anthracite Coal Tonnage.

Mr. John H. Jones, Chief of Bureau of Anthracite Coal Statistics, has issued the following statement of anthracite coal tonnage for the month of June, 1888, compared with same period last year:

	June.			
	1888.	1887.		Inc.
Phila. & Reading	573,596	560,299	I.	13,296
Lehigh Valley	502,537	481,127	I.	21,410
Central of N. J.	432,716	408,548	I.	24,168
Del., Lack. & West.	488,283	455,316	I.	32,967
Del. & Hud. Canal Co.	291,652	266,331	I.	25,321
Pennsylvania	456,161	355,182	I.	100,979
Pennsylvania Coal Co.	155,558	117,700	I.	37,858
N. Y., L. E. & W.	77,146	66,205	I.	10,941
Total	2,977,649	2,710,708	I.	266,941
From Wyoming Region	1,611,279	1,390,254	I.	221,017
" Lehigh "	488,593	503,741	I.	15,148
" Schuylkill "	877,784	816,713	I.	61,071

	Year.			
	1888.	1887.		Inc. or Dec.
Phila. & Reading	2,637,758	3,318,584	D.	680,826
Lehigh Valley	2,663,509	3,138,524	D.	475,015
Central of N. J.	2,384,167	2,233,626	I.	50,421
Del., Lack. & West.	3,076,453	2,553,910	I.	522,543
Del. & Hud. Canal Co.	2,035,146	1,765,050	I.	270,096
Pennsylvania	2,168,616	1,726,151	I.	442,464
Pennsylvania Coal Co.	742,830	675,321	I.	67,509
N. Y., L. E. & W.	446,976	392,280	I.	54,697
Total	16,155,455	15,903,446	I.	252,009
From Wyoming Region	10,153,164	8,265,142	I.	1,888,022
" Lehigh "	1,819,123	2,889,005	D.	1,069,882
" Schuylkill "	4,183,168	4,749,299	D.	566,131

The stock of coal on hand at tide-water shipping points June 30, 1888, was 741,598 tons; on May 31, 1888, 812,425 tons, an increase of 70,467 tons.

This statement includes the entire production of anthracite coal, excepting that consumed by employés, and for steam and heating purposes about the mines, but does not represent the entire anthracite coal tonnage actually transported by the respective roads, adjustment being necessary in the compilation to avoid duplications, etc.

Cotton.

The cotton movement for the week ending July 20 is reported as follows, in bales:

Interior markets:	1888.	1887.	Increase.	P. c.
Receipts	4,119	1,165	I. 2,954	200.0
Shipments	10,316	5,825	I. 4,491	80.0
Stock	31,470	29,188	I. 2,282	7.0
Seaports:				
Receipts	10,062	3,295	I. 6,767	200.0
Exports	32,533	18,931	I. 13,602	72.0
Stock	215,368	212,622	I. 2,746	0.7

Coal.

The coal tonnages for the week ending July 21 are reported as follows:

	1888.	1887.	Increase.	P. c.
Anthracite	887,285	664,052	223,233	33.6
Bituminous	305,881	247,812	58,069	23.5

The Cumberland coal trade for the week ending July 21 amounted to 65,394 tons, and for the year to that date 1,908,874 tons.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending July 14, and the year to that date, was as follows:

	Coal.	Coke.	Total.
Total for week ending July 14	218,372	71,120	289,492
Total for year 1888 to date	6,212,421	2,059,397	8,271,818
Total for year 1887 to date	5,575,093	1,721,902	7,296,995

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey division for the same periods was as follows:

	1888.	1887.	Inc. or Dec.
Total for week ending July 14	29,931	26,107	I. 3,824
Total for year to July 14	810,020	915,812	D. 105,791

Railroad Earnings.

General McNulta, Receiver of the Wabash, has issued the following report of the receipts and disbursements for the month of June:

Cash on hand May 31, 1888	$208,055	
Receipts in June	781,958	
		$990,013
Disbursements in June	$828,433	
Balance cash on hand June 30, 1888	$161,579	

The following is the summary of receipts and disbursements from Jan. 1 to June 30:

RECEIPTS.

From operation of road	$13,661,978

DISBURSEMENTS.

For operation of road	$10,893,679
For track rentals	252,118
For New York & Pacific Car Trust Association, interest and expenses	191,941
For Chicago & Western Indiana sinking fund	36,646
For personal injury claims	11,173
For taxes 1886 and 1887	452,447
For interest on first mortgage bonds	1,588,068
For allowances to bondholders and counsel	60,886
For amount paid for Chicago & Western Indiana	636
For payments account steamer line	12,810
Total	$13,500,399
Balance, cash on hand, June 30, 1888	161,579

The following is a statement of the earnings and expenses of the Baltimore & Ohio for June and the nine months ending June 30:

Month of June:	1888.	1887.	Inc. or Dec.
Gross earnings	$1,711,079	$1,641,396	I. $69,683
Oper. expenses	1,256,400	1,230,413	I. 25,987
Net earnings	$454,679	$410,983	I. $43,696
Nine months to June 30:			
Gross earnings	$14,965,829	$14,907,271	I. $58,558
Oper. expenses	10,923,339	10,620,066	I. 303,273
Net earnings	$4,042,490	$4,287,205	D. $244,715

Earnings of railroad lines for various periods are reported as follows:

Month of June:	1888.	1887.	Inc. or Dec.	P.c.
Atlantic & Pac.	$231,477	$209,158	I. $22,319	10.5
Buff., R. & Pitts.	140,155	188,532	D. 48,377	25.5
Bur., C. R. & Nor.	222,148	217,446	I. 4,702	1.8
Cairo, V. & Chic.	53,239	63,226	D. 9,987	14.3
Cal. South	129,659	98,744	I. 30,915	30.6
Canadian Pac.	1,120,000	1,059,507	I. 60,493	5.6
Cape F. & Y. V.	24,154	17,984	I. 6,170	35.3
Central of Iowa	105,407	92,614	I. 12,793	13.0
Ches., O. & S. W.	138,850	144,446	D. 5,596	3.4
Chic. & Atlantic	196,927	182,812	I. 14,115	7.7
Chi. & East. Ill.	171,032	168,973	I. 2,059	1.2
Chi. & Ind. Coal	36,237	28,548	I. 7,689	25.0
Chi., Mil. & St. P.	2,001,000	2,119,199	D. 118,199	5.6
Chic. & Ohio R.	3,987	4,734	D. 747	15.8
Chi., St. P. & K. C.	188,741	138,477	I. 50,264	36.2
Chi. & W. M.	119,046	109,025	I. 10,021	9.1
Cin., J. & Mack.	45,923	35,108	I. 10,815	30.0
Cin., N. O. & T. P.	296,224	270,458	I. 25,766	9.2
Ala. Gt. South.	111,345	117,668	D. 6,323	5.1
N. Orl. & N. E.	60,977	46,802	I. 14,175	30.4
Vicks. & Mer.	27,555	30,899	D. 3,344	10.0
V., Shre. & P.	32,204	31,821	I. 383	1.2
Cin., R. & Ft. W.	32,259	34,922	D. 2,663	5.8
Cin. & Springf'd.	96,293	98,432	D. 2,139	2.0
Cin., W. & Balt.	158,620	164,952	D. 6,332	3.6
*Cleve., Ak. & Co.	38,625	32,947	I. 5,678	16.0
Cl., C., C. & I.	318,194	329,956	D. 11,762	3.3
Cleve. & Mar.	22,497	22,170	I. 327	1.5
Col. & Cin. Mid.	32,341	25,131	I. 7,210	28.0
Col., H. V. & T.	265,669	198,582	I. 67,087	34.0
Den. & R. G.	674,000	677,241	D. 3,241	0.4
Den. & R. G. W.	97,250	90,050	I. 7,200	7.7
Det., Lan. & No.	73,526	96,116	D. 22,590	23.0
E. Tenn., V. & G.	431,624	415,370	I. 16,254	3.8
Ev. & Indianap.	17,005	17,963	D. 958	5.3
Ev. & Terre H.	61,850	72,815	D. 10,965	14.0
Flint & P. M.	185,030	225,234	D. 40,204	17.7
Fla. Ry. & N. Co.	80,893	81,033	D. 140	0.1
*Ft. W. & Den. C.	61,741	35,166	I. 26,581	74.3
Georgia Pacific	92,391	85,738	I. 6,653	7.1
Gr. Rapids & Ind.	188,502	200,534	D. 12,032	6.0
Other lines	15,838	13,515	I. 2,323	15.4
†Grand Tr. of Can.	1,482,451	1,560,353	D. 77,902	4.9
Houston & T. C.	156,121	161,361	D. 5,240	3.1
Hum. & Shen.	13,300	11,587	I. 1,713	9.1
Ill. C. (I. & S. Div.)	873,815	877,015	D. 3,200	0.3
Cedar F. & M.	8,643	9,095	D. 452	5.0
Dub. & Sioux C.	69,341	65,105	I. 4,236	6.2
I. F. & S. City.	57,303	52,319	I. 4,984	7.7
Kanawha & Ohio.	24,463	14,405	I. 10,058	71.4
*K. C., Ft. S. & M.	220,943	250,781	D. 29,838	11.7
*K. C., Cl. & Spr.	15,908	12,668	I. 3,240	25.0
Keok. & West	25,469	25,809	D. 340	1.4
Kingston & Pem.	19,883	18,660	I. 1,223	5.5
Lake E. & W.	165,503	165,364	I. 139	0.1
Lehigh & H.	22,551	21,804	I. 751	3.4
L. Rk. & M.	40,280	46,068	D. 5,788	11.0
Long Island	366,734	321,156	I. 45,578	14.0
Lou., Ev. & St. L.	74,105	84,972	D. 10,867	12.0
Louisv. & Nashv.	1,260,630	1,260,214	I. 416	....
Louis., N. A. & C.	185,257	188,898	D. 3,641	1.6
Lou., N. O. & Tex	140,445	108,229	I. 32,216	29.6
Mar., Col. & Nor.	5,880	6,596	D. 716	10.8
Memphis & Chas.	107,317	111,964	D. 4,647	3.6
‡Mexican Central	365,448	351,285	I. 14,163	4.0
*‡Mexican Rail.	248,098	202,640	I. 45,458	22.5
Mil., L. S. & W.	295,241	353,239	D. 57,998	16.1
Mil. & Northern.	90,291	69,695	I. 20,596	29.0
Minn. & St. L.	114,339	113,459	I. 880	0.7
Mobile & Ohio.	192,258	176,912	I. 15,346	8.5
Nash., C. & St. L.	228,181	241,071	D. 12,890	5.0
Nat., Jack. & Col.	9,311	11,258	D. 1,947	9.1
N. Y. C. & H. R.	2,896,216	2,847,614	I. 48,602	1.9
N. Y. & Northern	52,886	49,281	I. 3,605	6.1
N. Y., O. & West.	150,831	130,759	I. 20,072	15.4
Norfolk & West.	345,545	308,690	I. 36,855	11.6
Northern Pacific.	1,587,428	1,149,102	I. 438,326	38.1
Ohio & Miss.	292,533	297,924	D. 5,391	1.7
Ohio River	36,784	27,472	I. 9,312	33.3
Ohio Southern.	31,485	36,708	D. 5,223	14.0
Pitts. & Western.	173,799	147,584	I. 26,215	17.7
Rich. & Danville.	315,700	296,561	I. 19,139	6.4
Va. Mid. Div.	132,435	130,210	I. 2,225	1.6
Char., C. & A.	51,050	50,834	I. 216	0.4
Col. & Gr. Div.	27,160	25,039	I. 2,121	8.0
West. N. C. Div.	50,650	59,951	D. 9,301	15.2
W. O. & W. Div.	9,030	8,530	I. 500	5.8
Ashev. & S. Div.	7,070	4,500	I. 2,570	50.0
Tot. R. & D. Sys	593,095	575,684	I. 17,411	3.0
§St. L., A. & T. H.	152,358	152,659	D. 301	0.2
Branches	65,762	63,606	I. 2,156	3.2
St. L., A. & Tex.	220,186	183,587	I. 36,599	20.0
St. L. & San F.	466,973	479,772	D. 12,799	2.5
St. P., M. & Man.	765,124	613,080	I. 152,044	24.8
*San A. & Aran. P	76,633	30,089	I. 46,544	153.3
Shenandoah Val.	77,000	74,885	I. 2,115	2.7
Stat. Isl. Rap. T.	110,788	100,418	I. 10,370	10.0
Texas & Pacific.	466,136	385,076	I. 81,060	21.1
Tol., A. A. & N. M.	51,228	39,180	I. 12,048	30.7
Tol. & Ohio Cent.	80,354	78,833	I. 1,521	1.2
Tol., P. & West.	65,636	73,512	D. 7,876	9.6
Wabash West.	470,922	521,216	D. 50,294	9.6
W. N. Y. & Penn.	271,700	228,170	I. 43,530	18.9
Wheeling & L. E.	72,119	62,328	I. 9,791	16.5
‖Wisconsin Cent.	318,239	334,317	D. 16,078	4.7
Total	$25,171,704	$24,179,507	I. $992,197	4.1

* Includes three weeks only of June in each year.
† For four weeks ended June 30.
§ Including Indianapolis & St. Louis.
‡ Mexican currency.
‖ All lines.

Month of June:	1888.	1887.	Inc. or Dec.	P.c.
Balt. & Ohio:				
Lines E. of O.	$1,336,678	$1,278,081	I. 58,597	4.5
Net	440,928	347,659	I. 93,269	26.7
Lines W. of O.	374,401	363,315	I. 11,086	3.1
Net	13,751	63,324	D. 49,573	77.7
Total all lines	1,711,079	1,641,396	I. 69,683	4.2
Net	454,679	410,983	I. 43,696	10.5
Nash., C. & St. L.	228,181	241,071	D. 12,890	5.0
Net	105,404	117,830	D. 12,426	10.2
Oreg. R. & N. Co.	*515,100	444,731	I. 70,369	15.8
Net	*174,100	205,988	D. 31,888	15.1
Rich. & W. P. Ter.				
Rich. & Danv.	295,451	296,561	D. 1,110	0.4
Net	104,672	105,268	D. 596	0.5
Virginia Midl.	151,079	137,668	I. 13,411	10.0
Net	69,496	61,130	I. 8,366	13.1
Char., Col. & A.	49,704	50,834	D. 1,130	2.0
Net	7,977	2,069	I. 5,908	250.0
Col. & Gr. Div.	32,557	25,039	I. 7,518	28.0
Net	3,331	def. 12,627	I. 15,958	125.0
W. N. Car. Div.	42,573	59,951	D. 17,378	28.8
Net	4,498	5,725	D. 1,227	20.0
T. C. & I. Co. net.	57,000	42,600	I. 14,400	33.3

* Estimated in 1888.

Month of May:	1888.	1887.	Inc. or Dec.	P.c.
Bur., C. R. & No.	$194,501	$216,788	D. $22,287	10.2
Net	24,486	26,082	D. 1,596	4.0
Cairo, V. & C.	54,107	63,102	D. 8,995	12.7
Net	14,267	22,005	D. 7,738	32.0
Ches., O. & S. W.	151,582	131,382	I. 20,200	15.3
Net	43,301	42,310	I. 990	2.3
Chic., Burl. & N.	146,089	238,403	D. 92,314	38.7
Net	6,595	69,555	D. 62,960	90.0
C., In., St. L. & C	215,713	217,707	D. 1,994	0.4
Net	91,078	80,033	I. 11,045	13.7
Den. & R. G.	657,089	611,241	I. 45,848	7.3
Net	233,928	258,253	D. 24,325	9.3
Ft. W. & Den. C.	88,990	53,812	I. 35,178	66.1
Net	37,669	18,182	I. 19,487	105.0
Gr. Trunk of C.	£312,992	£316,232	D. £3,240	0.9
Net	109,324	108,948	I. 376	0.3
Chic. & Gr. T.	56,171	56,006	I. 165	0.3
Net	15,460	14,861	I. 599	4.0
D., G. H. & Mil.	18,207	18,363	D. 156	0.8
Net	4,204	3,970	I. 234	6.0
Kentucky Cent.	$74,200	$87,765	D. $13,565	15.0
Net	26,107	32,987	D. 6,880	18.7
L., N. A. & Chic.	186,736	183,192	I. 3,544	1.6
Net	27,923	48,663	I. 19,260	39.4
Mexican Central.	510,978	394,743	I. 116,235	29.5
Net	161,033	183,758	D. 22,725	12.0
Mexican Nat.	199,562	157,739	I. 41,823	26.1
Net	def. 27,884	22,142	D. 50,026	227.3
Minn. & St. L.	103,601	118,677	D. 15,076	12.8
Net	12,338	17,932	D. 5,594	29.4
New Brunswick	67,500	50,225	I. 17,305	34.0
Net	15,675	8,533	I. 7,142	87.5
Ohio River	37,939	29,596	I. 8,343	27.6
Net	15,570	14,045	I. 1,525	7.1
Ore. Imp. Co	452,154	365,733	I. 86,421	23.6
Net	139,561	122,106	I. 17,455	13.9
Southern Pacific:				
Pac. Sys.	3,607,184	2,381,002	I. 626,182	26.3
Net	1,084,969	1,206,687	D. 121,718	10.0
Total So. Pa. Co.	3,864,297	3,295,169	I. 569,128	17.2
Net	1,312,106	1,549,042	D. 236,936	15.2
Wabash	533,914	548,670	D. 14,756	2.5
Net	58,453	153,577	D. 95,124	62.1
Total (gross)	$2,415,474	$8,670,171	I. $745,303	8.6
Total (net)	2,888,262	3,291,489	D. 403,227	12.2
Five months—Jan. 1 to May 31:				
Bur., C. R. & Nor.	$1,026,533	$1,155,025	D. $128,492	11.1
Net	188,478	292,883	D. 106,405	36.3
Cairo, V. & C.	274,644	285,154	D. 10,510	3.5
Net	67,813	65,544	I. 2,269	3.1
Ches., O. & S. W.	769,650	681,351	I. 88,299	12.9
Net	243,575	239,424	I. 4,151	1.6
Chi., Bur. & No.	621,358	1,067,648	D. 446,290	41.8
Net	3,897	275,320	D. 271,423	98.6
C., I., St. L. & C.	1,042,159	1,068,001	D. 25,842	2.3
Net	389,848	417,448	D. 27,600	6.4
Den. & R. Gr.	2,876,234	2,878,295	D. 2,061	....
Net	777,520	1,100,545	D. 323,025	19.4
F. W. & D. C.	354,184	246,009	I. 108,175	44.0
Net	126,070	94,213	I. 31,857	33.0
Grand Tr. of C.	£1,377,396	£1,488,785	D. £111,389	7.4
Net	347,701	423,956	D. 76,255	13.2
Chic. & Gr. Tr.	268,436	281,581	D. 13,145	6.6
Net	65,128	70,404	D. 5,276	7.1
D., G. H. & Mil.	86,146	95,567	D. 9,421	9.4
Net	14,357	17,370	D. 3,013	17.7
Kentucky Cent.	$364,091	$373,815	D. $9,724	2.4
Net	120,288	131,483	D. 11,195	8.4
L., N. A. & Chic.	823,334	835,875	D. 12,541	1.4
Net	226,328	167,864	I. 58,464	34.8
Mex. Central.	2,543,369	1,967,408	I. 575,961	29.2
Net	1,077,522	922,390	I. 155,132	16.8
Mex. National.	989,110	752,043	I. 237,077	31.5
Net	def. 78,291	130,687	D. 208,978	160.0
Minn. & St. L.	502,012	615,511	D. 113,499	18.3
Net	73,891	137,301	D. 61,410	45.2
New Brunswick	321,067	285,754	I. 35,313	12.3
Net	82,871	43,944	I. 38,907	88.3
Ohio River	152,078	102,475	I. 49,903	48.0
Net	57,778	33,770	I. 24,008	73.0
Ore Imp. Co.	2,086,414	1,466,394	I. 620,020	42.3
Net	440,197	334,504	I. 105,693	31.4
Southern Pacific:				
Pacific Sys.	13,651,454	10,251,024	I. 3,400,430	33.1
Net	4,784,801	4,277,895	I. 506,906	11.8
Total So. Pacific.	18,334,638	14,108,209	I. 4,226,429	29.2
Net	6,107,099	5,029,803	I. 1,077,296	21.4
Wabash	2,405,620	2,542,902	D. 137,282	5.4
Net	385,157	841,675	D. 456,518	54.2
Total (gross)	$43,821,228	$39,518,653	I. $4,302,575	10.8
Total (net)	12,368,437	12,748,923	D. 380,486	2.9

A Netting for the Upper Berth.

The Pullman Company is using a new device on a number of its cars running on the large roads, by which occupants of upper berths are protected against the possibility of being thrown out. It consists of a netting resembling a hammock, which is fastened from the edge of the berth to the top of the car and can readily be adjusted at a moment's notice. Mr. H. S. Billings, Superintendent of the Erie & Atlantic division, is the inventor.

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